a journal for precision engineers and all users of industrial diamonds and other hard materials

INDUSTRIAL DIAMOND REVIEW

incorporating INDUSTRIAL DIAMOND ABSTRACTS

I.D.R.
National Lending Library for Science and Technology.

MONTHLY 1/3 SUBSCRIPTION 15/- A YEAR

March, 1959 Vol. 19 No. 220

4450
MECHANICAL ENGINEERING RESEARCH LABORATORY
31 MAR 1959
LIBRARY

AUSTRALIA
BENELUX
BRAZIL
BRITISH GUIANA
CANADA
FRANCE
GREAT BRITAIN
INDIA
ITALY
JAPAN
NEW ZEALAND
SCANDINAVIA
SPAIN
SWITZERLAND

Triefus

INDUSTRIAL DIAMONDS
TRIEFUS & CO. LTD.,
THAVIES INN HOUSE, 4, HOLBORN CIRCUS,
LONDON, E.C.1, ENGLAND
Telephone : FLEet Street 9741 Cables : Triefus, London

DIAMOND PRODUCTS
TRIEFUS INDUSTRIES LTD.,
MANOR ROYAL, CRAWLEY, SUSSEX, ENGLAND
Telephone : Crawley 2244 Cables : Triefus, Crawley
DRILL BITS DIAMOND TOOLS
DIAMOND MICRO-POWDERS

INDUSTRIAL DIAMOND COMPANY (SALES) LTD.

INDUSTRIAL

DIAMONDS

FOR ALL

APPLICATIONS

ENQUIRIES INVITED

88/90 · HATTON GARDEN · LONDON · E·C·1

Telephone: HOLBORN 2642/2247 *Telegrams:* IDECE, LONDON

Are you as satisfied with your Diamond Tools as you could be?

Whatever your application, from straightforward Dressing to precision Turning, there is an Indusmond Diamond Tool to cut your costs and increase efficiency. Backed by technical representatives in all parts of the country, this service is at your disposal without obligation. May we send you a copy of our catalogue illustrating some of the many Diamond Tools and Wheels we manufacture?

Indusmond

INDUSMOND - THE COMPLETE DIAMOND TOOL SERVICE

INDUSMOND (DIAMOND TOOLS) LTD ● 4, GREVILLE ST., LONDON E.C.1

Northern Office ● SUSSEX STREET, SHEFFIELD 4. Telephone SHEFFIELD 20701

Birmingham & Midlands ● Mr. G. H. CHURCHWARD, COOKHILL, Nr. ALCESTER, WORCS.

MICROSTRUCTURES OF DIAMOND SURFACES

By S. Tolansky, D.Sc., F.R.S.

Read what the Reviewers say about this important book :—

This is a delightful book : firstly because it is a record of a piece of highly individual research by one school supervised and inspired by one man ; secondly, because it is superbly illustrated. Indeed, although the letterpress is easy to read, the ideas being clearly and simply expressed, it is probably the plates that will sell the book . . . Prof. Tolansky has developed new and very powerful optical techniques which actually reveal and enable him to measure surface steps or discontinuities of as little as 10 A., the effective useful magnification in such a case being X 500,000. . . . Cleavage, polishing, etching and sawing of diamond faces, octahedral, cubic, and dodecahedral, are all discussed in the light of really remarkable photographs, and some information is given on the difficult problem of " the two types of diamond."—Kathleen Lonsdale in " Science Progress."

Prof. Tolansky has been well served by the Goldsmiths' Press, whose wide experiences of diamond publishing has doubtless contributed to the success with which they have reproduced so many of his magnificent photographs of diamond surfaces. . . . Although all these methods are simple applications of well-known optical principles, it has remained for Prof. Tolansky to develop them into an extraordinary powerful array, needing skill to be sure, for their successful application, but comparatively little equipment beyond a good optical microscope to obtain one-dimensional resolution which compares favourably with that of the electron microscope. . . . The appearance of this book will be a welcome stimulant to many engaged in diamond research. It also provides valuable data for comparison with the artificial crystals of germanium and silicon, on which such an immense amount of effort is now being expended by the electrical industry. Since the stages of growth can actually be followed for these metals, comparative studies might well resolve some of the fascinating problems so literally brought to light by Prof. Tolansky's researches.—H. J. Grenville-Wells in " Laboratory Practice."

To those who use diamond as a tool, the information in the last two chapters, on " ring-crack " damage to diamonds, and on the surface condition of mechanically polished diamonds, should be specially worthy of study."—F. C. Franks.

Some of the traditionally accepted facts about diamond surfaces have been contradicted by Prof. Tolansky since he began studying the gem in his laboratory. His recent observations are described in " Microstructures of Diamond Surfaces." He reports, for instance, that tradition has it that diamonds have a perfect cleavage in particular directions. From optical studies of cleavage surfaces he says that " the cleavage is optically very far from perfect except in one type of diamond."—" Tooling and Production," Huebner Publications Inc.

CONTENTS

The Optical Techniques
Some Characteristics of Diamond
The Topography of the Natural Octahedron Faces
The Nature of the Trigons
Some Growth Features on Octahedron Faces
Linear Discontinuities on Diamonds (Slip ?)
The Etching of Diamond
Diamond Cleavage
Optical Shadow Casting
Percussion (pressure) Marks on Diamond
Polished Diamonds
143 *Special Art Plates*

NO LIBRARY ON DIAMOND IS COMPLETE WITHOUT THIS ESSENTIAL BOOK

ORDER FORM

To Book Department, NAG Press Ltd.,
226 Latymer Court, Hammersmith, London, W.6.

Please send me .....copies of " Microstructures of Diamond Surfaces," by Professor Tolansky.

Name .....

Address .....

40/- per copy, 41/6 by post. £.....enclosed.
$8.50 in U.S.A. and Canada.

Distributed in U.S.A. and Canada by Huebner Publications Inc., 1975 Lee Road, Cleveland, Ohio.

Exporters

WOLVERHAMPTON
DIAMOND DIE
& TOOL CO. LTD.

ALL GRADES OF
BOARTS AND INDUSTRIAL DIAMONDS

11 HATTON GARDEN LONDON E.C.1

TELEPHONE HOLBORN 3017 CABLE PARDIMON LONDON

DIAMANT BOART

DIAMOND IMPREGNATED TOOLS
ARE USED ALL OVER THE WORLD

Wheels

Saws

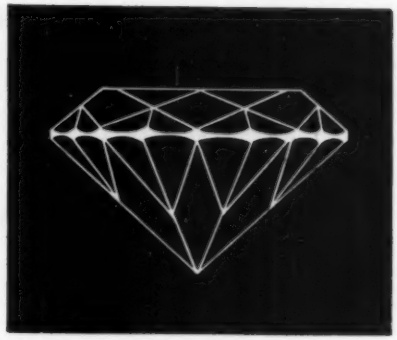
Drill Bits

Truing and dressing tools .·. Hones Boring Crowns
Dental Tools

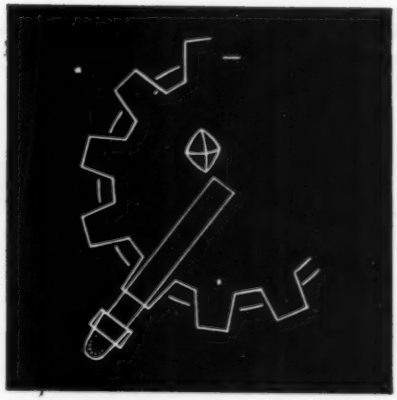
74, avenue du Pont de Luttre, Brussels, Belgium
Sole representative in U.K. : **Compentrad Ltd, 31, Throgmorton Street, London, E.C.2**

D. DRUKKER & ZN. N.V.

SPECIALISTS in
INDUSTRIAL DIAMONDS
cleaving and sorting



diamonds in art and industry



amsterdam, holland.
12 sarphatikade

phone : **67321** (3 lines)
cable : **DUBBELDEE.**

If you are interested in our products please visit our works

INDUSTRIAL DIAMOND REVIEW

Vol 19 No 220
MARCH 1959

Editor-in-Chief :
Eric M. Bruton

Managing Editor :
Patrick Greene

★

© 1959 *N.A.G. Press Ltd.—All rights reserved.*

PRINCIPAL CONTENTS

Generally Speaking — **Adamant** — **45**

Drilling into the Earth's Mantle — **T. F. Gaskell** — **46**

Diamond Grinding Wheels (Cont.) — **G. Pahlitzsch and G. Rafflenbeul** — **52**

Eighteenth Century Diamond Trading — **59**

★

Industrial Diamond Review is published monthly at 1s 3d per copy, and is obtainable through newsagents and booksellers or by postal subscription (15s yearly, post free). Subscriptions in the United States of America are $2.50, and can be entered through the usual subscription agencies or direct through the publishers :—

N.A.G. Press Ltd
226 Latymer Court
London W.6.
(Telephone : RIVerside 2143).

★

Contributions of scientific, technical and practical interest, and news items, are invited, but responsibility cannot be accepted for the safety of MSS, drawings, photographs or other matter submitted. Material not accepted will be returned.

★

All editorial communications should be made to the Managing Editor at
2 Charterhouse Street
London E.C.1
(Telephone : FLEet Street 1577)

Printed by
Martin's Printing Works Ltd., Berwick-upon-Tweed, England

Generally Speaking

Education for Industry

In a television interview, given on his return a short time ago from a visit of investigation to the United States, the Minister of Education, Mr Geoffrey Lloyd, said that one part of education in this country that required improvement was training for leadership in industry and commerce. He went on to mention two US educational centres which he thought were particularly valuable in those fields, the Massachusetts Institute of Technology, and the Havard Business School.

There is nothing at present in this country that is quite the equivalent of these establishments, although perhaps the new Churchill College at Cambridge, when it is fully established, may take up a position approximately equivalent to that of the MIT, and it is hoped that the various Colleges of Advance Technology will also do something to fill this gap in our system.

More could be done than at present for technological education by industry itself, especially through the medium of the industrial research associations, which are in a particularly good position to give instruction to potential leaders. Much is done already in this way—for example, the courses, ranging from two-day refresher sessions to six-months advanced courses, offered by the Production Engineering Research Association. Other associations have similar schemes, each in itself well-planned and most useful, but it may be doubted whether there is not room for a considerable extension, both in the provision of such courses and in their use by the industries concerned. As Mr Lloyd has clearly indicated, a steady supply of well-trained, up-to-date technical men to act as leaders is essential if our engineering industries are to hold their own against world competition.

Standardization

The increased accuracy of physical measurements of all types made possible as instruments are improved and developed means that greater accuracy in definition of units is essential: the

minute differences in the definition of the yard, for example, in the United States and the various countries of the Commonwealth were not significant fifty years ago, but today they would be sufficiently great to interfere seriously with a number of calculations. It is satisfactory therefore, to be able to record that agreement has been reached between this country, the United States, Canada, South Africa, Australia, and New Zealand, redefining the yard in terms of the metre, and the pound in terms of the kilogramme to

Concluded on p59

Drilling Into the Earth's Mantle

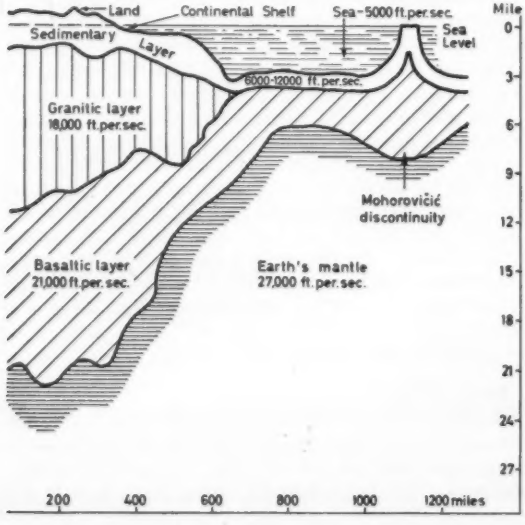
by T. F. Gaskell, M.A., Ph.D*

Dr Gaskell, as one of the chief scientists of a leading oil company, has had a great deal of practical experience of deep boring problems in many parts of the world, and has studied the theoretical aspects of this subject very deeply. He believes that the cost (perhaps several million £) of a deep hole drilled into the earth's mantle would be repaid by the improvements in ordinary oil well drilling that would result from the new experience gained this way. Dr Gaskell points out, however, that a considerable amount of development will be necessary, both for the drilling equipment and for the diamond drill crowns, before such a project could be successfully undertaken.

Introduction

Our knowledge of the inside of the earth is derived mainly from the measurements made by seismologists on the travel of earthquake waves. We know that the kind of rocks that we see in considerable variety on the surface form only a thin outer skin 10 to 20 miles thick, compared to the 8,000 mile diameter of the earth. Beneath this skin is the earth's mantle, and the Mohorovicic discontinuity (the Moho) is the boundary between the mantle and the assorted surface rocks (Fig 1). This discontinuity marks a very sharp change in the velocity with which earthquake waves travel—a jump from about 21,000 ft/sec to 27,000 ft/second. The mantle extends about half-way to the centre of the earth, and encloses a core which the earthquake seismic waves demonstrate to be fluid.

Fig 1. A section through the earth's crust showing how the mantle is closer to the surface beneath the oceans.



The use of artificial earthquakes has been common practice for many years now in studying the earth's crust. The seismic prospecting methods that are used to locate underground oil reservoirs employ explosions to probe down to the various rock layers. The times of travel of the explosion waves that are reflected from buried rock interfaces provide a measure of the depths of the rock layers, and observations made at a series of different distances from the source of the waves enable the velocity of the waves in the rock layer to be calculated. The velocity determinations provide a form of label to the rock, but unfortunately there is a wide spread to the values of velocity for similar sorts of rock. For example, limestone may vary from about 7,000 ft/sec for soft chalk to 21,000 ft/sec for a hard massive limestone, while volcanic rocks have been found in which the velocity ranges from 14,000 ft/sec to 28,000 ft/second. Although, therefore, the seismic experiments show the approximate depth and the shape of the surface of the underground layers of rock, they do not give a firm indication of the type of rock. Incidentally, they do not, of course, tell whether or not the rock contains oil. In order to draw an unambiguous picture of the subsurface geology, it is necessary to follow particular rock layers from their surface outcrops, or from boreholes. The layer below the Moho does not come to the surface, and it is therefore necessary to drill down in order to find out what is the material—what chemical or radioactive properties it has—that forms the earth's mantle.

The Moho has been plotted at many places beneath the continents by measuring waves from

* Senior Physicist, Exploration Department of British Petroleum Co Ltd.

quarry blasts, or such explosions as that used recently in Canada to remove Ripple Rock from the channel separating Vancouver Island from the mainland. Beneath the oceans similar measurements have been made by exploding depth charges below the sea-surface. It is found that the mantle lies at a depth of about 20 miles under the land, but that underneath the deep oceans it is less than a third of this distance. Fig 1 shows the continuous mantle with the thick continental crust thinning out over the oceans. The nearest the mantle comes to the surface of land is under oceanic islands and here it is about 10 miles below surface.

Hole drilling—ancient and modern

The deepest hole so far drilled is 25,000 ft—just over four miles. This hole, like most deep borings, was drilled to find oil, and it is the oil industry that is responsible for most of the developments that have taken place in drilling. The total depth drilled is now well over a million miles, and last year in the USA alone 40,000 miles of oil wells were drilled—enough to go several times right through the earth. Since 1927 there has been a steady increase in the depth of the deepest hole, from 8,000 to 25,000 feet. However, wells are nothing new, and they have been dug to hundreds of feet in search of water from time immemorial. For example, the ancient Chinese used a very effective percussion type of drill to bore holes to tap artesian sources of brine in order to make salt. The oil industry took over what methods were available, and even as late as 1895, oil-wells—in the true sense of the word—were being dug by pick and shovel in Rumania.

This laborious process was soon found to be quite unsuitable for the holes thousands of feet deep which were required to find the larger oil fields. Besides, a boring of a few inches diameter was found to be sufficient to produce a large supply of oil and was easier to control in those cases where the oil gushed out under pressure. Also, it was found necessary to use a steel lining to stop the hole falling in, and for large diameters this lining was excessively expensive. The early boreholes were made by the repeated dropping of a chisel, weighing about ten tons, on to the rock. The chisel was supported on a rope in the ' cable tool ' method, and on a string of poles in the ' Canadian rod ' method. The Canadian method was well suited to shallow holes, where the rock was tenacious, and was used in Rumania and Russia, However, it was the cable tool that found most of the oil in the first part of this century. It is interesting to compare the cable tool rig with the picture of the old Chinese boring team (Fig 2). The tool

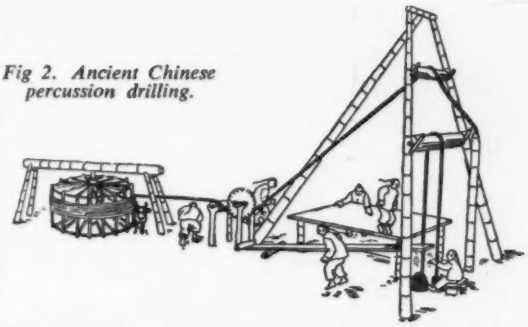


Fig 2. Ancient Chinese percussion drilling.

is bumped on the bottom of the hole by the drillers jumping in turn on the beam. They managed to drill 1,500 to 1,800 feet with this apparatus, even though it took two or three years. Many of the curious names associated with a drilling rig are derived from these old methods; the bull wheel, for instance, on which the cable is spooled, is seen here actually being turned by bull-power.

Most modern oil well drilling is carried out by rotary rigs in which rock is penetrated by rotating a hard steel or diamond cutter at the end of a long string of drill-pipe. The process is similar, but the scale is different, to making a hole in a piece of metal with an electric drill. The enormous length to diameter ratio of the drill-pipe is not always appreciated. A scale model of a deep string of drill-pipe appears as a very fine thread; for example, a 20,000 ft length of drill-pipe scaled down to a length of 30 ft would have to be only seven thousandths of an inch in diameter. It is obvious that the cutting tool cannot be forced into the rock by pressing on such a long flexible length of pipe, because the pipe would buckle. The tool is therefore driven into the rock by about 20 or 30 tons of extra thick pipe at the bottom of the hole, and the main length of the drill-pipe supports and rotates this bottom section. It makes one wonder whether, if the drilling engineers had stopped to consider the future scale of their operations instead of gradually extending the depth of hole that they drilled, they would ever have started deep rotary drilling. It seems almost impossible to penetrate rock by rotating a cutting bit at the end of miles of thin pipe. It is not surprising, of course, that some thought has been given to putting the motive power for the bit at the bottom of the hole. Electric motors have been tried without great success, since it is difficult and perhaps dangerous to handle the large electric power needed with cables that are subjected to the wear and tear of running in and out of a borehole.

Fig 3. Conventional coring and non-coring diamond bits.

Much more commonly used is a multi-stage turbine motor, which is driven by mud and water pumped down the drill pipe and up the space between the drill pipe and the walls of the hole. The driving motor consists of a hundred little rotor elements, which give enough power to rotate the bit many times faster than the conventional rotary system. The friction of the drill pipe all the way down the walls of the bore-hole limits the rotary drilling speed to about 120 rev/minute. High rotation speed means correspondingly faster rock penetration, but, apart from this, light-weight drill pipe can be used; the pipe only carries the weight of the turbine, but does not have to twist it round. Since, moreover, the pipe is not rotated, there is very little wear on the sides of the bore hole. Futhermore, if the cutting bit jams on an extra tough piece of rock, the turbine will be halted but the mud will circulate and keep the hole free; with the rotary, jamming of the bit often means that the drill pipe is twisted until it breaks off.

The turbo has another potential advantage which has not yet been realized. Because the drill pipe is not rotated, the turbo may be made to alter course by setting the axis of the drill at a few degrees to the drill pipe with an elbow joint. There is no reason why this process could not be in some way controlled from the surface, so that the drill could be virtually steered in any direction. The rate of penetration of the drill is roughly proportional to the weight which is allowed to press downwards on the bit, but there is a limit to the weight which can be applied because in a narrow bore hole the weight must be distributed over a length of heavy drill pipe. Any slight bending of the pipe causes the drill to go off course, and this effect is often accentuated by the non-uniformity of the rock strata themselves. If the drill can be steered along the true course it is possible to press harder on the drill bit while still keeping straight, and thus to penetrate the rock correspondingly faster.

Downtime

Even with very fast drilling it is still necessary to spend time every now and again pulling up all the drill pipe to renew the drilling bit when the cutting teeth become worn. This process of pulling out, including the time taken to unscrew and stack a few miles of drill pipe, takes several hours. Much engineering development has gone into improving the life of drilling bits, and a recent advance has been to construct a bit which can be folded up and pulled up the inside of the pipe on a wire, so that a replacement can be lowered to carry on drilling without any need of removing the pipe itself from the hole. It is obviously much faster to wind up a wire on a drum than to unscrew all the pipe. This device is in its infancy, and a more revolutionary approach is to speed up the actual pulling out and unscrewing of the drill pipe by means of a double hydraulic lift. The first lift raises a length of pipe, then the second lift raises the next section while the joint is being unscrewed and the first length of pipe is being stacked away. The first lift now goes down to catch hold of a third length of pipe and so a continuous hand-over-hand process goes on. These improvements in complete automation of the pipe handling processes will not only save time and labour on the rig, they will also give more carefully controlled operation. Normally, the driller feeds the pipe into the hole by controlling the cable drum with a brake, but in paying out wire from a winch it is difficult to avoid jerks as the wire unwinds. These jerks mean that an even

pressure is not being applied to the drill bit at the bottom of the bore hole, so that sometimes the bit will tend to race and abrade itself and sometimes it will almost be pulled up standing. A servo-mechanism could provide a much more uniform feed of drill pipe into the hole, and 'automatic drillers' are, in fact, coming into common use. The servo system will be even better when used with smooth hydraulic feed instead of raising and lowering the drill-pipe by cable.

The driller's job is not made less important, however, by these improvements; in fact, it is becoming more skilled and technical with each new advance. One of the problems that calls for expert knowledge is the behaviour of the mud that is circulated down the drill pipe and which flows up the space between the pipe and the walls of the hole, carrying with it the fragments of rock that have been cut by the bit. It is fairly obvious that the chippings must be removed, and this is one of the main functions of the mud. It was only recently, however, that laboratory experiments showed that very rapid removal of the chippings was important. Almost as much work must be done to grind up a chip as is required to form the chip from the parent rock in the first place. For efficient drilling, then, a chip must be removed before the next cutting tooth of the bit reaches it. Special outlets are made in modern drill bits to direct a stream of mud in the right places to do this. In order to carry the rock chippings to the surface the mud must move at several feet per second.

The mud has other jobs to perform, and its composition is usually a compromise. In the first place, the mud must not settle out into its constituent parts if left standing, because, if it did, the solid material sinking to the bottom would jam the drilling tools solidly in the ground. Using an ideal mud, however, a thin layer of dried mud cake forms over the walls of the bore-hole and in this way preserves the mud from contamination with any soluble compounds in the rock that is being drilled. At the same time the mud cake on the walls of the hole gives strength to resist crumbling of soft materials such as clays and shales. The weight of the mud column itself is important because it holds back the walls of the hole from caving, in much the same way as pit-props support the roofs of coal mines. Not only does mud help to keep the walls of the bore-hole from collapsing, but it also holds back high pressure fluids—which may be water, oil, or gas—from entering the bore and causing trouble at the surface.

It is unlikely that high pressure gas will be encountered in drilling the 10-mile deep hole to the Moho. Borings at Bikini and Eniwetok have already demonstrated that hard basaltic rock will be reached at a few thousand feet below the surface, and seismic measurements have suggested that this basaltic rock continues uniformly until the 10-mile depth of the earth's mantle. This tough basaltic rock will not need a protecting wall of mud because it is rigid enough to stand up securely on its own. The top part of the hole, which will pass through loose and porous coral rock, can be walled off with a strong steel casing. The main part of the hole will, however, present new problems, and in some ways these may be more akin to those met in gold prospecting than in looking for oil. Oil is not found in hard igneous rocks, and normally these problems are not encountered in oil well drilling. On the other hand, core holes up to 6,000 ft in length have been drilled in order to assess the potential of gold-bearing quartz strata.

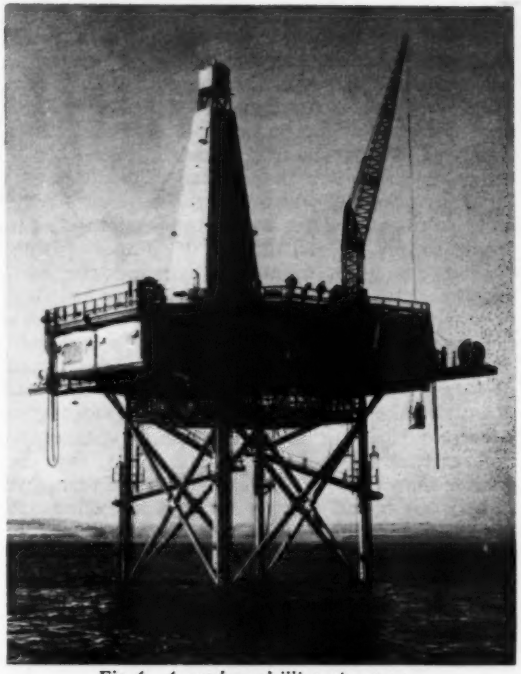


Fig 4. A modern drilling rig at sea.
(Photo: The Times Review of Industry)

It is possible that water will suffice instead of mud as the circulating fluid; some form of circulating fluid will almost certainly be needed because although the rock may stand up without the assistance of a hydrostatic column, some cooling and lubricating of the drill bit will be required. The temperature 10 miles deep is expected to be anywhere between 200 and 375

deg C—well above the boiling point of water. The pressure of the water column will prohibit boiling down the hole, but it will be necessary to cool the water when it reaches the surface. There will be no fundamental difficulty in this, and in fact it might be possible to circulate sea water. The most likely site for the bore-hole, in order to encounter the Moho at as shallow a depth as possible, will be on the edge of a coral atoll, so that sea water will be one commodity in ample supply. Rock drilling in mining is often carried out using diamond bits, and the hard basalt that will be met in the deep bore hole will probably best be cut in this way. With the high speed rotation of the turbo-drill it might be possible to increase the normal few feet an hour rate up to, say, 10 ft an hour. Even at this rate it would take over two hundred days drilling to penetrate 50,000 ft of rock. The time taken to pull out and renew the drilling bit may be greater than this. At present rates the complete in and out round trip would take more than 30 hours with the hole at its deepest, but it may be possible to achieve an improvement of a factor of three with the new automatic hydraulic lifts mentioned earlier. The life of a bit in very hard rock may be equivalent to only fifty feet of drilling, so that there will possibly be a thousand trips in and out of the bore hole. Even with the fast automatic pull out, the time taken will be at least as long as that spent drilling.

Possible developments

It is possible, of course, that a modern version of the old cable tool type of percussion drilling, with its rapid method of pulling the tools out on a wire rope, may be more suited to the hard basalt rock; for example, pneumatic chippers, operating in dry holes, and using a stream of air to bring the rock chippings to the surface, have been very effective in the Sahara recently in drilling tough siliceous limestone.

It is not unreasonable to consider even more fanciful means of cutting rock when standard methods are only capable of penetrating a few feet an hour. One such method is that of burning a hole by means of a flame torch. This is used for the fifty foot type of hole that is used for shot-firing in mining. Suggestions have also been made that hard tough rock might be successfully broken up by letting off explosive charges at the bottom of the hole. The loosened debris could be removed subsequently by conventional drilling methods. A small charge of an ounce or so should shatter about six inches of rock, and if a technique could be devised to fire a shot every few minutes a drilling rate of ten feet or so an hour could be achieved.

It is quite clear that considerable research work is needed to produce a workable method of drilling the 50,000 ft hole down to the Moho; but the type of research work required is, in fact, already proceeding as part of the normal progress of oil-well drilling and rock mining. For example, the correct operation of the diamond cutter has been shown to depend on careful control of mud circulation and the weight that presses the bit on to the rock face, and a factor of ten in distance of rock penetrated before the bit wears out may soon be possible. After all, diamond is tougher than the rock it cuts and, theoretically, need not wear at all. It is the opinion of most oceanographers and seismologists who are interested in this deep hole project, that the research in finding out exactly how the diamond drills operate will provide the key to the successful achievement of drilling to the mantle. Perhaps it may be necessary to employ a cutting bit made of a solid matrix of diamonds and steel, so that any wearing of the bit face will leave a good cutting edge still exposed. This may in turn necessitate some method of recovering the diamonds that fall out of the matrix as the steel wears away. Any research done along these lines will benefit the oil industry. At present, even conventional diamond bits, with diamond embedded in the outer face only of a steel core, are expensive, especially when the diamonds are broken by careless handling. If it can be demonstrated that a single bit, even though it costs thousands of pounds, will drill a complete oil well without the need for pulling the bit out of the hole, oil companies may be prepared to face the initial capital investment. It is often the pulling out process, together with the extra time in which the hole can deteriorate, that causes many of the delays that occur in oil-well drilling. The walls of the hole may collapse and grip the drill pipe, or obstructions may form which stop the bit on its way out of the hole. If the diamond industry can produce what is virtually an everlasting bit it will prove to be a great advance in drilling technique.

It looks then, as if the problem of drilling to the mantle could be successfully tackled now if the money for the project is forthcoming. The cost will be in the millions of pounds class, but this is a lot cheaper than shooting at the moon. The most promising way to drill the hole would be a combination of diamond bit with turbo-drill and fully automatic lifting mechanism, using sea-water circulation. The research effort to make the necessary improvements in the various components of this scheme would undoubtedly be repaid by speeding up normal oil-well drilling —just as motor racing has helped to produce better vehicles for everyday use.

Fig. 1 and 2 by courtesy of the Institute of Petroleum

ALL OVER THE WORLD

B·O·A·C

TAKES GOOD CARE OF YOUR CARGO

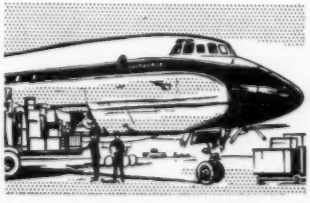
Fly goods BOAC—for fastest delivery by modern airliners to most of the world's important centres. BOAC's new London Airport warehouse offers expert staff plus unrivalled handling facilities (transhipment only takes an hour!). And BOAC Appointed Shipping and Forwarding Agents work with BOAC to streamline collection, Customs clearance, handling and delivery. For advice, just ring BOAC and ask for "SKYLOAD"—your direct link with the freight expert.

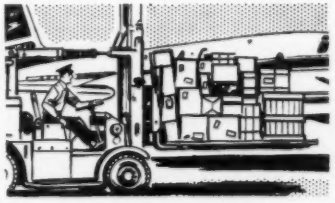
ACROSS THE ATLANTIC

Fastest overnight service to New York. Special collection nightly (Mondays to Saturdays) from Paddington, Euston, St. Pancras and King's Cross for same-night despatch. Also frequent services to Boston, Detroit, Chicago and San Francisco . . . to Montreal . . . and to Bermuda, Nassau, the Caribbean and Caracas.

SERVICES TO ALL AFRICA

The whole of Africa is well-served by BOAC. Choose from many swift services between London and East, Central and South Africa; also to Nigeria and Ghana. There is ample cargo capacity on all routes.





MIDDLE EAST FAR EAST AND AUSTRALIA

BOAC offers you an excellent cargo service to important countries throughout the East and to Australasia. They include Iraq, Persia, Pakistan, India and Ceylon, Malaya, Hong Kong, Japan, Australia and New Zealand.

YOUR CARGO GETS THERE FASTER BY JET-PROP BRITANNIA
—NOW OPERATING ON MOST ROUTES

BRITISH OVERSEAS AIRWAYS CORPORATION WITH ASSOCIATE AIRLINES

Grinding Sintered Carbide, Especially Sintered Carbide Cutting Tools, with Diamond Grinding Wheels

by

G. Pahlitzsch *and* **G. Rafflenbeul**

Continued from p 36, February

4.24 Scratch depth of the cutting edges

With respect to the scratch depth the same applies, in broad outline, as has been said for surface finish. The smoothness of the cutting edges ground with BZ and K wheels with the grinding speeds under consideration is shown in Fig. 11. The shape of the bond is more or less the same as for the surface finish, but it is even less possible to show within narrow limits the smoothness obtained under definite conditions, than it is for surface finish.

A comparison of the results shows that after the first grinding minutes in grinding with K wheels, the scratches of the edges are some 0.5 to 1 micron deeper than with BZ wheels. It has also to be considered that besides the self-sharpening of the K wheel, produced by the wear of the bond, the fact that an individual grinding grain is considerably more firmly fixed in the BZ than in the K bond also plays a part.

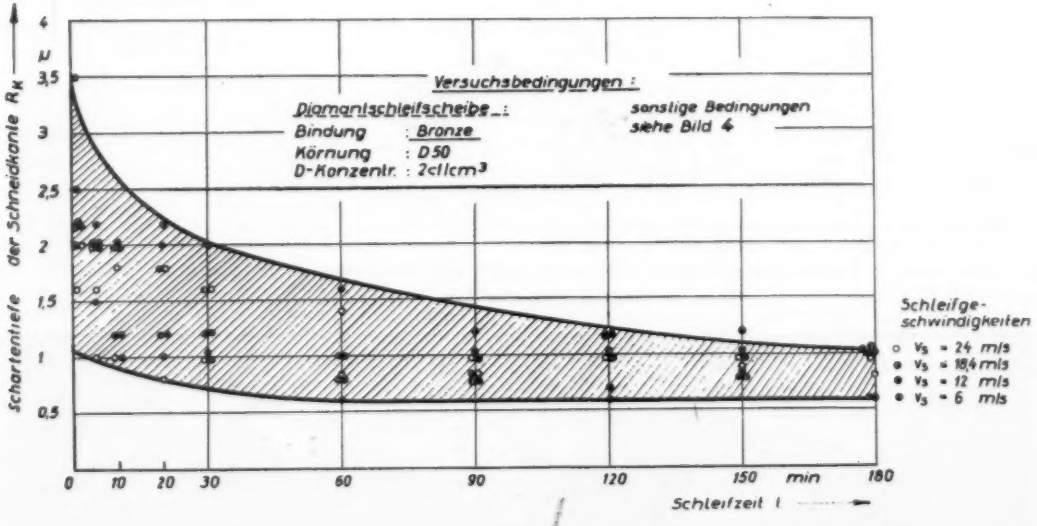
Fig 12A shows that the smoothness of the cutter ground with a sharp BZ wheel becomes less at higher grinding speeds, while after a prolonged period of grinding no difference is apparent. With K wheels, on the other hand (Fig 12B), an increasing grinding speed has a negative effect in every case, on the quality of the cutting edge. It is recommended, in order to obtain smaller scratch depths, to apply a lower grinding speed with K wheels than with BZ wheels.

For the smoothness of the cutters the following limit values occur for the cutting rake angle $\beta = 90°$:

BZ wheels: after 1 min grinding time:
$R_k = 1.5 \ldots 3.5$ micron
after 180 min grinding time:
$R_k = 0.5 \ldots 1.0$ micron

K wheels: after 1 min grinding time:
$R_k = 1.5 \ldots 3.0$ micron
after 180 min grinding time:
$R_k = 1.0 \ldots 2.0$ micron

Fig 11A. Smoothness of the cutting edge at a grinding speed of 6 to 24 m/sec in relation to the grinding time (bronze bond). Translation: *Schartentiefe der Schneidkante R_K = smoothness of cutting edge R_K; Versuchsbedingungen = conditions of experiment; Diamantschleifscheibe = diamond grinding wheel; Bindung: Bronze = bond bronze; Koernung: D50 = mesh size: D50; D-Konzentr.: 2 ct/cm³ = diamond concentration: 2 ct/cub cm; sonstige Bedingungen = other conditions; siehe Bild 4 = see Fig 4; Schleifzeit t = grinding time t; Schleifgeschwindigkeiten = grinding speeds.*



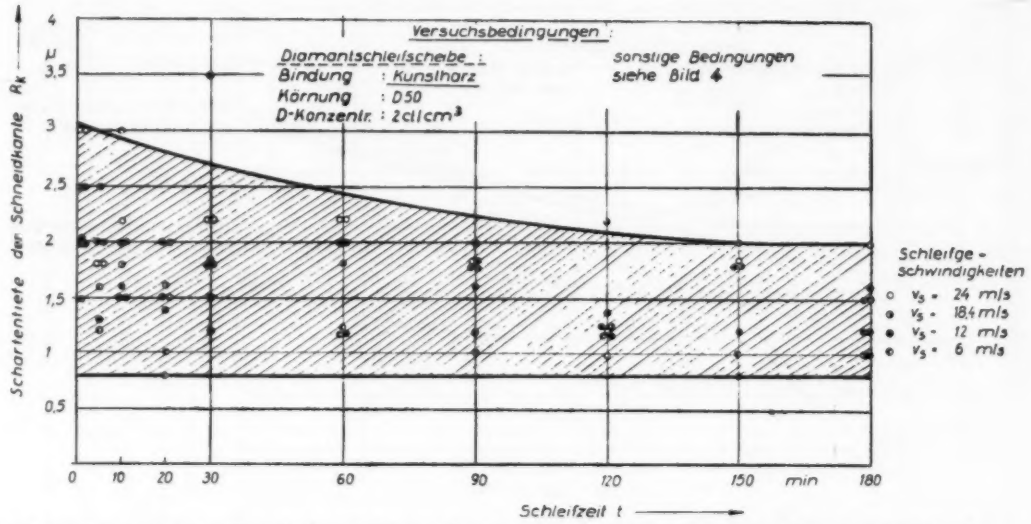
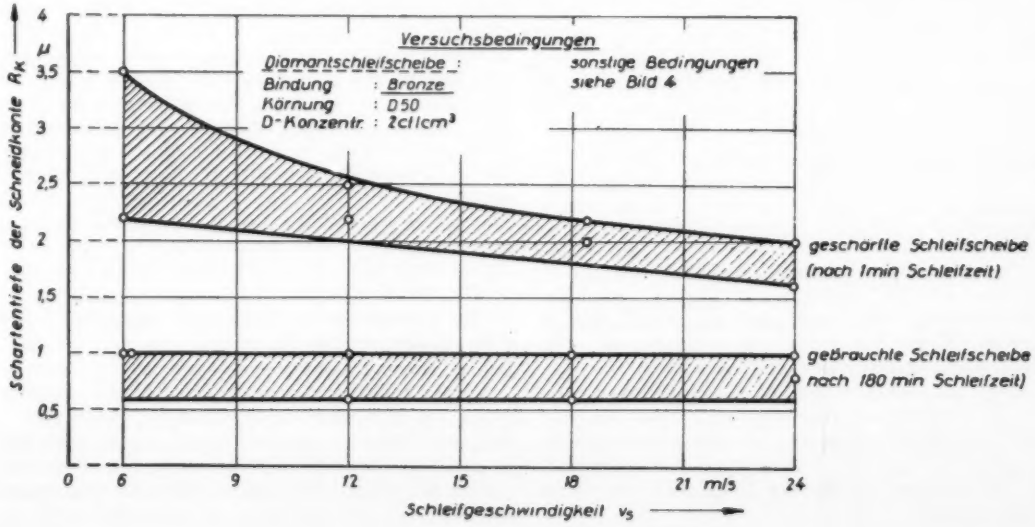


Fig 11*B*. *Smoothness of cutting edge at grinding speeds of* 6 *to* 24 *m/sec in relation to the grinding time (resin bond).*
Translation: *Schartentiefe der Schneidkante* R_K = *smoothness of cutting edge* R_K; *Versuchsbedingungen* = *conditions of experiment*; *Diamantschleifscheibe* = *diamond grinding wheel*; *Bindung*: *Kunstharz* = *bond*: *resin*; *Koernung*: D50 = *mesh size*: *D*50; *D-Konzentr.*: 2 *ct/cub cm* = *diamond concentration*: 2 *ct/cub cm*; *sonstige Bedingungen siehe Bild* 4 = *for other conditions see Fig* 4; *Schleifzeit t* = *grinding time t*; *Schleifgeschwindigkeiten* = *grinding speeds.*

Fig 12*A*. *Smoothness of cutting edge after* 1 *minute or* 180 *minutes of grinding time in relation to the grinding speed (bronze bond).*
Translation: *Schartentiefe der Schneidkante* R_K = *smoothness of cutting edge* R_K; *Versuchsbedingungen* = *conditions of experiment*; *Diamantschleifscheibe* = *diamond grinding wheel*; *Bindung*: *Bronze* = *bond*: *bronze*; *Koernung*: *D*50 = *mesh size*: *D*50; *D-Konzentr* 2 *ct/cm*³ = *diamond concentration*: 2 *ct/cub cm*; *sonstige Bedlingungen siehe Bild* 4 = *for other conditions see Fig* 4; *Schleifgeschwindigkeit* v_s = *grinding time* v_s; *geschaefte Schleifscheibe* = *sharpened grinding wheel*; (*nach* 1 *min Schleifzeit*) = (*after* 1 *min grinding time*); *gebrauchte Schleifscheibe* = *consumed grinding wheel*; (*nach* 180 *min Schleifzeit*) = (*after* 180 *min grinding time*).



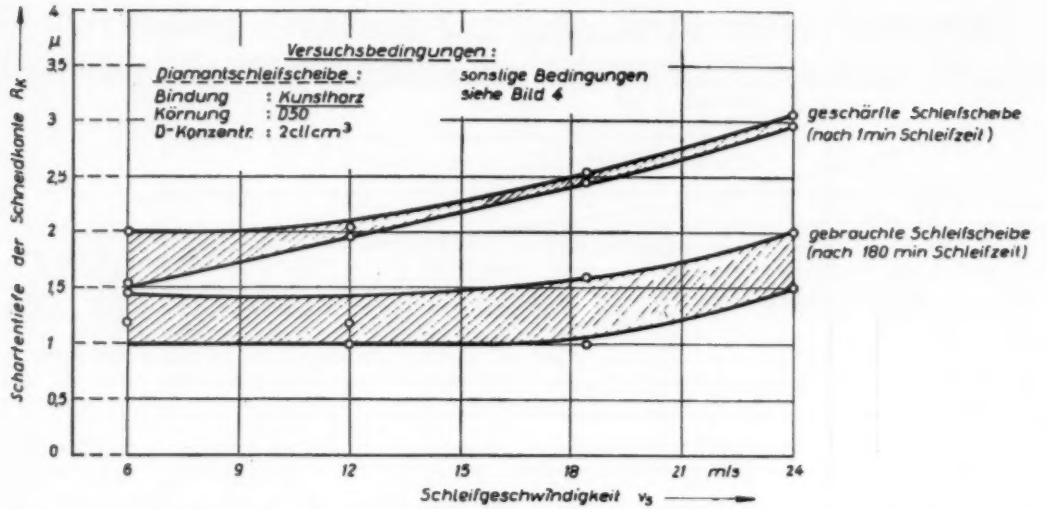


Fig 12B. Smoothness of cutting edge after 1 minute or 180 minutes of grinding time in relation to the grinding speed (resin bond).
Translation: *Schartentiefe der Schneidkante R_K = smoothness of cutting edge; Versuchsbedingungen = conditions of experiment; Diamantschleifscheibe = diamond grinding wheel; Bindung: Kunstharz = bond: resin; Koernung: D50 = mesh size: D50; D-Konzentr. 2 ct/cub cm = diamond concentration: 2 ct/cm³ = diamond concentration 2 ct/cub cm; sonstige Bedingungen siehe Bild 4 = for other conditions see Fig 4; Schleifgeschwindigkeit = grinding speed; geschaerfte Schleifscheibe = sharpened grinding wheel; (nach 1 min Schleifzeit) = (after 1 min grinding time); gebrauchte Schleifscheibe = consumed grinding wheel; (nach 180 min Schleifzeit) = (after 180 min grinding time).*

5. Influence of the surface pressure on the grinding results of grinding wheels with bronze and resin bonds

5.1 *Conditions of experiments*

The following conditions must be added to those described in 4.1:

Grinding speed v_s:	M 18 m/sec
Pressure P:	400, 800, 1600, 2000, 2400, and 3200 g
Surface pressure p:	5, 10, 20, 25, 30, and 40 g/sq mm
Type of sintered carbide:	S1
Specific weight of sintered carbide:	10.4 ± 0.2 g/cub cm

5.2 *Results of experiments*

5.21 Abrasion of sintered carbide

The increase of sintered carbide abrasion A with the grinding time has a similar curve for the various surface pressures with BZ and K wheels as was shown for the speed experiments. An illustration is therefore not necessary.

With BZ wheels (Fig 13A) the sintered carbide abrasion in the region examined rises linearly with the surface pressure. A rise in the surface pressure, or rather the pressure force applied, by 100% causes an increase in abrasion of about 50%.

For K wheels (Fig 13B), from a certain surface pressure upwards, a decrease in the abrasion of sintered carbide occurs. An increase in the abrasion was only obtained under the given conditions up to a surface pressure of p = 20 to 25 g/sq mm. Then the load limit of the K wheel is approached, this being reached at p = 30 g/sq mm, in other words P = 2,400 g. While the flow of coolant is directed straight on to the grinding region up to a surface pressure of p = 20 g/sq mm, it must be directed on to an inner edge of the grinding face if this pressure is exceeded. Thus, as a result of the centrifugal force, a regularly distributed film of fluid will form on the surface of the grinding face, which will act as a cushion between wheel and sintered carbide surfaces, thereby lessening wear. If this continuous film of coolant is absent ' burning ' of the wheel will occur.

The abrasion of the K wheel is between 45 and 60% of that of the BZ wheel.

5.22 Grinding wheel wear

Under 4.22 it was pointed out that the absolute wear (ΔH_s) assumes a parabolic shape on a graph. The same phenomenon occurs with the increase of the surface pressure, as Fig 13 shows.

For BZ wheels the same applies as was stated in 4.22.

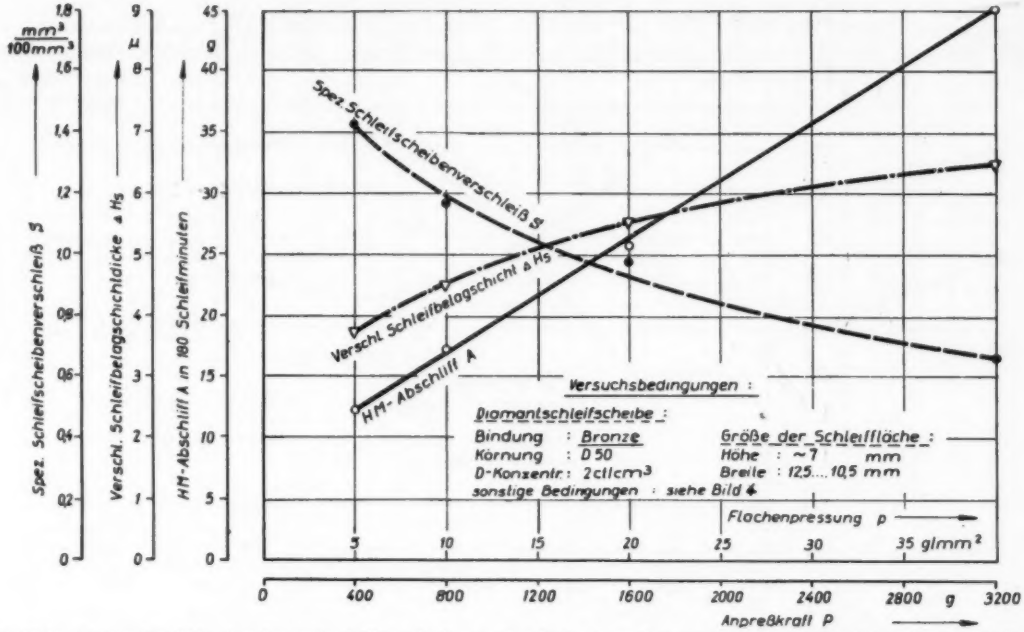


Fig 13A. Sintered carbide abrasion and grinding wheel wear in relation to surface pressure, or pressure force (bronze bond). Translation: *Spez. Schleifscheibenverschleiss S = specific grinding wheel wear S; Verschl Schleifbelgschichtdicke = thickness of abraded grinding layer; HM-Abschliff A in* 180 *Schleifminuten = sintered carbide abrasion A in* 180 *minutes of grinding; Versuchsbedingungen = conditions of experiment; Diamantschleifscheibe = diamond grinding wheel; Bindung: Bronze = bond: bronze; Koernung: D50 = mesh size: D50; D-Konzentr: 2 ct/cm³ = diamond concentration: 2 ct/cub cm; sonstige Bedingungen siehe Bild 4 = for other conditions see Fig 4; Groesse der Schleiffläeche = size of grinding surface; Hoehe = height; Briete = width; Flaechenpressung p = surface pressure p; Anpresskraft P = pressure force P.*

The absolute wear ΔH_s of the K wheel reaches its highest value in the region examined at 24 micron. The film of coolant, which prevents an increase of abrasion at high surface pressures, as an enclosed cushion, has, however, no influence on the absolute wear, as the continuous course of the graph for ΔH_s over the surface pressure shows (Fig 13B). Thus the specific wear continues once more to rise after reaching a certain surface pressure.

A comparison of the wear values for BZ and K wheels shows the following: If the ΔH_s value of the BZ wheel is set at 100%, then the absolute wear of the K wheel is about 195 to 300% higher than that of the BZ wheel. The specific wear S is, on an average, 7.6% with K wheels and 1.14% with BZ wheels, *ie* the specific wear of the K wheel is some six times greater than that of the BZ wheels.

A further increase of the surface pressure was impossible, as the BZ wheels became very hot when $p = 40$ g/sq mm, and the coolant began to produce a lot of steam. The sintered carbide showed little rise in temperature. The surface temperature of the BZ wheels rose from 35 to 40 deg C with a surface pressure of $p = 5$ g/sq mm, to about 75 to 80 deg C when $p = 40$ g/sq mm. The temperatures quoted were not measured during grinding, but about 30 sec after interruption of the grinding process.

5.23 Surface finish of the ground sintered carbide surfaces

The surface finish reached with different surface pressures are not significantly different from those shown in Fig 9. The relation of surface finish to surface pressure could not be ascertained.

The surface finish was roughly between the following limits:

BZ wheels: after 1 min grinding time:
$R = 1.0 \ldots 2.5$ micron
after 180 min grinding time:
$R < 0.5$ micron

K wheels: after 1 min grinding time:
$R = 1.0 \ldots 2.0$ micron
after 180 min grinding time:
$R = 0.5 \ldots 1.5$ micron

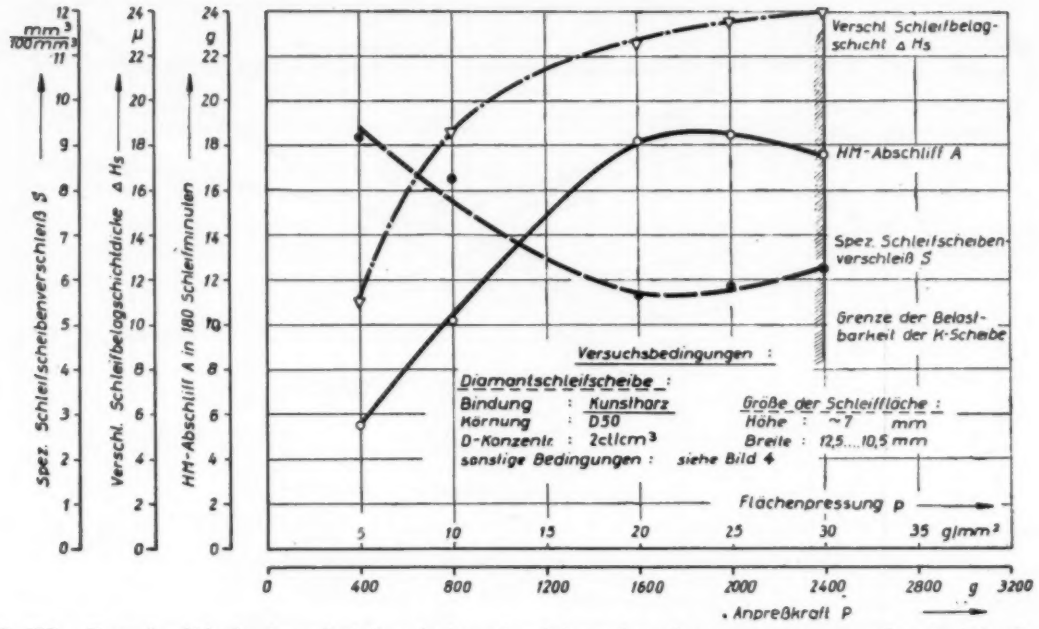


Fig 13B. *Sintered carbide abrasion and grinding wheel wear in relation to the surface pressure, or pressure force (resin bond).* Translation: *Spez. Schleifscheibenverschleiss S = specific grinding wheel wear S; Verschl Schleifbelagschichtdicke = thickness of abraded grinding layer; HM-Abschliff A in 180 schleifminuten = sintered carbide abrasion A in 180 minutes of grinding; Versuchsbedingungen = conditions of experiment; Diamantschleifscheibe = diamond grinding wheel; Bindung: Kunstharz = bond: resin; Koernung D50 = mesh size D 50; D-Konzentr. L 2 ct/cm³ = diamond concentration: 2 ct/cub cm; sonstige Bedingungen siehe Bild 4 = for other conditions see Fig 4; Groesse der Schleif-flaeche = size of grinding surface; Hoehe = height; Briete = width; Flaechenpressung p = surface pressure p; Anpresskraft P = pressure force P.*

5.24 Smoothness of the cutting edges

With regard to the smoothness the same applies as for the surface finish.

The limit values for the cutting rake angle $\beta = 90°$ were as follows:

BZ wheel: after 1 min grinding time:
$R_k = 2 \ldots 2.5$ micron
after 180 min grinding time:
$R_k = 0.5 \ldots 2$ micron

K wheels: after 1 min grinding time:
$R_k = 2 \ldots 3.5$ micron
after 180 min grinding time:
$R_k = 1 \ldots 2$ micron

6. Comparison of the influence of the grinding speed and the surface pressure on the grinding results

6.1 *General*

An unqualified comparison of the absolute values is not possible, for only one grinding speed v_s was combined with all the surface pressures p, and only one surface pressure with all the grinding speeds. For these reasons the values were recorded as percentages. The smallest absolute values are called 100% in each case. The surface finish of the sintered carbide surfaces and the smoothness of the cutting edges have already been considered thoroughly, so that further discussion does not appear necessary.

6.2 *Abrasion of sintered carbide*

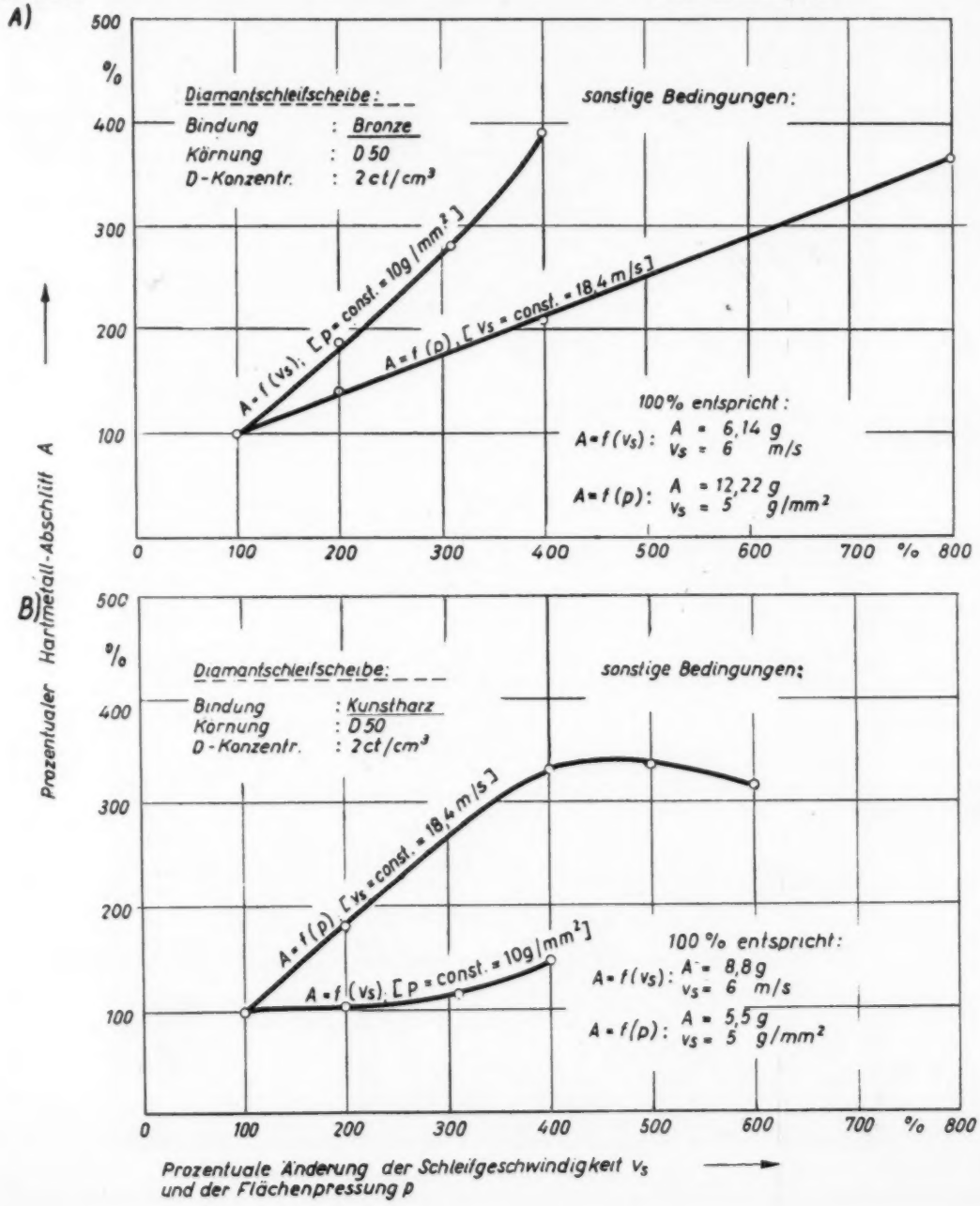
The BZ wheel showed, during increase both of grinding speed and of surface pressure, or force of pressure, an almost linear increase in abrasion. The considerably greater influence of the increase in grinding speed on the abrasion compared with that of the surface pressure is particularly clear in Fig 14A. The upward trend of the curve $A/_{Amin} = f(v_s)$ is about twice as big as the curve

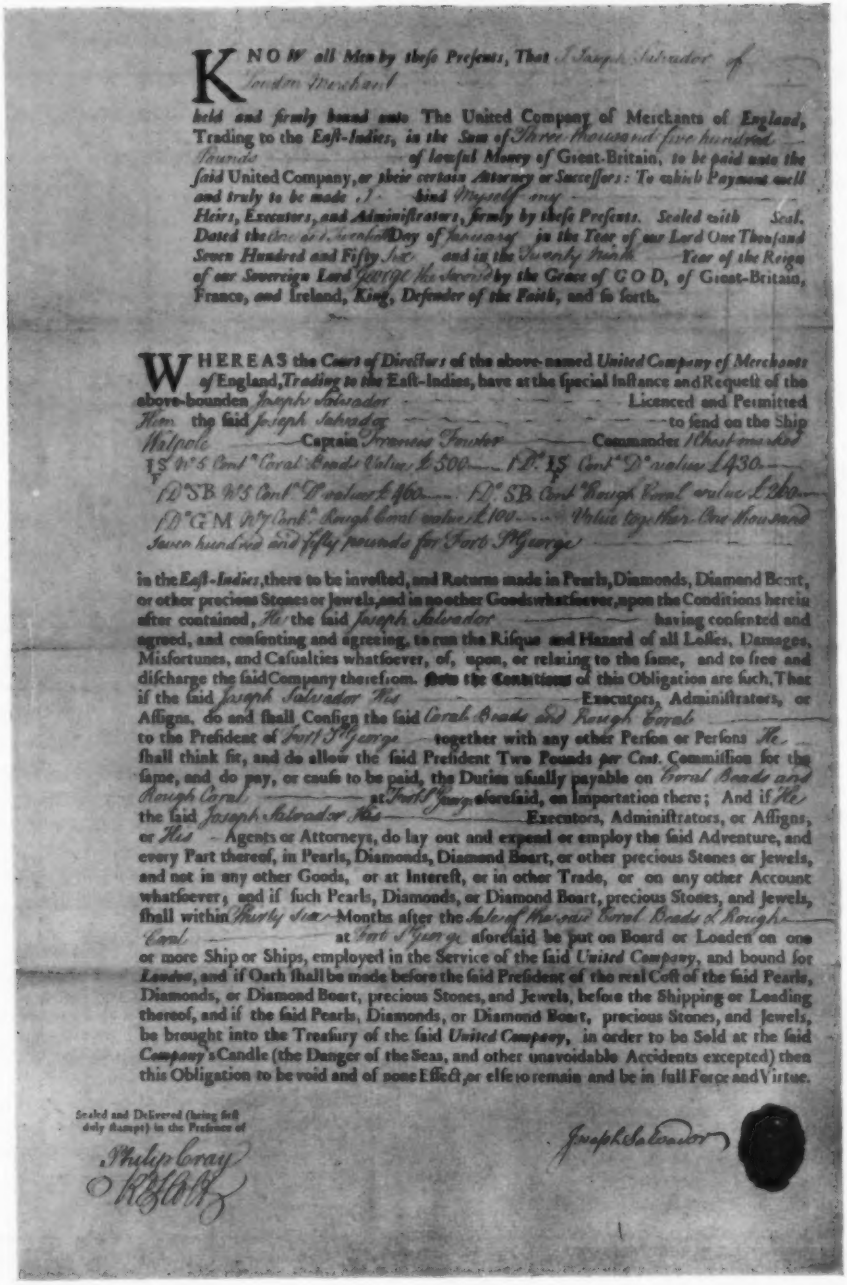
Fig 14. (Right) *Percentage of sintered carbide abrasion in relation to the percentage change in grinding speed or surface pressure.* Translation: *Prozentualer Hartmetall-Abschliff A = percentage of sintered carbide abrasion; Diamantschleifscheibe = diamond grinding wheel; Bindung: Bronze = bond: bronze; Koernung: D50 = mesh size: D50; D-Konzentr. 2 ct/cm³ = diamond concentration 2 ct/cub cm; sonstige Bedingungen = other conditions; 100% entspricht = 100% corresponds to; Bindung: Kunstharz = bond: resin; Prozentuale Aenderung der Schleifgeschwindigkeit = percentage change in grinding speed; und der Flaechenpressung p = and in surface pressure p .*

$A/_{Amin} = f(p)$. For obtaining greater abrasion the rise in grinding speed, with a BZ wheel, is twice as effective as an increase in the force of pressure.

With a K wheel the facts are exactly the reverse (Fig 14B). Here the surface pressure has a much stronger influence on the abrasion than

Continued on p 59


A)
500
%
400
300
200
100
Diamantschleifscheibe: _ _ _
Bindung : Bronze
Körnung : D 50
D-Konzentr. : 2 ct/cm³
sonstige Bedingungen:
A = f (vs), [p = const. = 10g/mm²]
A = f (p), [vs = const. = 18,4 m/s]
100% entspricht:
A = f (vs): A = 6,14 g
vs = 6 m/s
A = f (p): A = 12,22 g
vs = 5 g/mm²
0 100 200 300 400 500 600 700 % 800
B)
500
%
400
300
200
100
Diamantschleifscheibe: _ _ _
Bindung : Kunstharz
Körnung : D 50
D-Konzentr. : 2 ct/cm³
sonstige Bedingungen:
A = f (p), [vs = const. = 18,4 m/s]
A = f (vs), [p = const. = 10g/mm²]
100 % entspricht:
A = f (vs): A = 8,8 g
vs = 6 m/s
A = f (p): A = 5,5 g
vs = 5 g/mm²
0 100 200 300 400 500 600 700 % 800
Prozentualer Hartmetall-Abschliff A
Prozentuale Änderung der Schleifgeschwindigkeit vs und der Flächenpressung p



KNOW all Men by these Presents, That I Joseph Salvador of London Merchant held and firmly bound unto The United Company of Merchants of England, Trading to the East-Indies, in the Sum of Three thousand five hundred Pounds of lawful Money of Great-Britain, to be paid unto the said United Company, or their certain Attorney or Successors: To which Payment well and truly to be made I bind Myself my Heirs, Executors, and Administrators, firmly by these Presents. Sealed with my Seal. Dated the one & Twentieth Day of January in the Year of our Lord One Thousand Seven Hundred and Fifty Six and in the Twenty Ninth Year of the Reign of our Sovereign Lord George the Second by the Grace of GOD, of Great-Britain, France, and Ireland, King, Defender of the Faith, and so forth.

WHEREAS the Court of Directors of the above-named United Company of Merchants of England, Trading to the East-Indies, have at the special Instance and Request of the above-bounden Joseph Salvador Licenced and Permitted Him the said Joseph Salvador to send on the Ship Walpole Captain Ferneau Fowler Commander 1 Chest marked IS No 5 Cont Coral Beads Value £500 1 D IS Cont D° value £430 1 D SB No 5 Cont D° value £160 1 D SB Cont Rough Coral value £200 1 D GM No Cont D° Rough Coral value £100 Value together One thousand Seven hundred and fifty pounds for Fort St George in the East-Indies, there to be invested, and Returns made in Pearls, Diamonds, Diamond Boart, or other precious Stones or Jewels, and in no other Goods whatsoever, upon the Conditions herein after contained, He the said Joseph Salvador having consented and agreed, and consenting and agreeing, to run the Risque and Hazard of all Losses, Damages, Misfortunes, and Casualties whatsoever, of, upon, or relating to the same, and to free and discharge the said Company therefrom. Now the Conditions of this Obligation are such, That if the said Joseph Salvador His Executors, Administrators, or Assigns, do and shall Consign the said Coral Beads and Rough Coral to the President of Fort St George together with any other Person or Persons He shall think fit, and do allow the said President Two Pounds per Cent. Commission for the same, and do pay, or cause to be paid, the Duties usually payable on Coral Beads and Rough Coral at Fort St George aforesaid, on Importation there; And if He the said Joseph Salvador His Executors, Administrators, or Assigns, or His Agents or Attorneys, do lay out and expend or employ the said Adventure, and every Part thereof, in Pearls, Diamonds, Diamond Boart, or other precious Stones or Jewels, and not in any other Goods, or at Interest, or in other Trade, or on any other Account whatsoever; and if such Pearls, Diamonds, or Diamond Boart, precious Stones, and Jewels, shall within Thirty Six Months after the Sale of the said Coral Beads & Rough Coral at Fort St George aforesaid be put on Board or Loaden on one or more Ship or Ships, employed in the Service of the said United Company, and bound for London, and if Oath shall be made before the said President of the real Cost of the said Pearls, Diamonds, or Diamond Boart, precious Stones, and Jewels, before the Shipping or Loading thereof, and if the said Pearls, Diamonds, or Diamond Boart, precious Stones, and Jewels, be brought into the Treasury of the said United Company, in order to be Sold at the said Company's Candle (the Danger of the Seas, and other unavoidable Accidents excepted) then this Obligation to be void and of none Effect, or else to remain and be in full Force and Virtue.

Sealed and Delivered (being first duly Stamp't) in the Presence of

Philip Cray

Joseph Salvador

Eighteenth Century Diamond Trading

On the opposite page there is a reproduction, greatly reduced, of a commercial document of the mid eighteenth century, relating to the trade between London and the East Indies. Its particular interest to the Industrial Diamond Review lies in its mention of diamond boart, as well as gem diamond, as an article of trade.

The trade was considerable in amount, and was mostly carried on by private trading by the priveleged members of the English and Dutch East India Companies. The document reproduced here relates to such a venture, and is a form of indemnity given by the private trader to the Company.

The signatory of this document, Joseph Salvador, was the head of a family who were diamond traders in a large way of business amongst other commercial interests. The profits from the venture to which this document relates would hardly have been expected to be less than £5,000 or £6,000, a large sum two hundred years ago, and this was only one of many ventures to the Far East. It would be interesting to know what proportion of the whole was classified as 'diamond boart', and what use, other than for diamond cutting, was made of it; the exact meaning of 'boart' has never been very satisfactorily defined, varying from all other than gem quality, to types of material only suitable for crushing, according to the time and place. It is interesting, however, to notice that, even as early as the middle of the eighteenth century, diamond boart, or, as we should probably say now, industrial diamond, was a sufficiently important item of trade to figure in a printed form for the regular use of merchants.

Diamond Tool Co in Merger

The diamond tool manufactuirng interests of Impregnated Diamond Products Ltd, of Gloucester, and of Universal Grinding Wheel Company Ltd, of Stafford, are being concentrated at Gloucester as a result of the purchase by Universal Grinding Wheel Company Ltd from The Bath & Portland Stone Firms Ltd of a 50% shareholding in the Gloucester concern. The product will in future be sold in the United Kingdom under the trade name Uni-Neven by Universal Grinding Wheel Company Ltd in addition to the fields already covered by Wickman Ltd, of Coventry. The Wickman agency is unaffected by the merger. They will be supported by a specialist engineering sales force provided by Impregnated Diamond Products Limited. As a result of these moves Impregnated Diamond Products Ltd will be well placed to initiate a substantial drive in the export field and into new applications and markets at home.

The result of the merger will be to extend the range of production of IDP to include all types of bonded diamond tools, and of graded micro diamond powders.

A Research Laboratory will shortly be completed at Gloucester, where the combined research and development interests of Universal Grinding Wheel Company Ltd and of Impregnated Diamond Products Ltd in this field will be concentrated.

Grinding Sintered Carbide, Etc.

G. Pahlitzsch *and* **G. Rafflenbeul** (*Cont. from p.* 57)

the grinding speed. The capacity of the K wheel sets a limit to the surface pressure, however. If it is desired to obtain a higher abrasion with a K wheel, the surface pressure must lie close to the loadability limit.

To be concluded

Generally Speaking (*Conc. from p.* 46)

make truly international units.

A short while earlier the metre itself had been redefined in terms of radiation wavelength, replacing the old standard platinum-iridium bar. The very great improvement in the accuracy of these new definitions as compared with those existing previously should ensure that they will remain valid for a considerable period before having to be corrected. Greater accuracy with closer standardization is always to be welcomed, and although these changes are perhaps too small to affect industry directly, the trend is a good one.

ADAMANT.

THE HENDERSON DIAMOND TOOL COMPANY LTD.,

43-45 ALLESLEY OLD ROAD, COVENTRY

Telephone : Coventry 75617

MANUFACTURERS OF DIAMOND TOOLS.

ALL TYPES OF ABRASIVE DIAMOND TOOLS

RESET AND RETURNED WITHIN **48 HOURS**

OF RECEIPT AT THE ABOVE OFFICE.

TOOLS FOR SPECIALISTS MADE TO CUSTOMERS OWN REQUIREMENTS

CLASSIFIED ADVERTISEMENTS

2d. *a word, minimum* **4/-.** *Box Numbers* **1/-** *extra.*

Address Box No. replies to : N.A.G. PRESS, LTD., 226 Latymer Court, London, W.6.

TIME RECORDERS.—Sales—Rental Service. Tel. HOP. 2239. TIME RECORDER SUPPLY & MAINTENANCE CO. LTD., 157/159 Borough High Street, London, S.E. 1.

MR. M. DAVIDSON, F.S.M.C., qualified opthalmic optician, is in constant attendance, for sight-testing and dispensing of optical prescriptions, at the HATTON OPTICAL CO., 19 Hatton Garden, E.C.1. (Tel. HOL 8193).

DIAMOND POWDERS mesh and microns, purity 98/99% available. Also diamond splinters. Inquiries: **AFRIKA DIAMANT BOART, 24 VESTINGSTRAAT, ANTWERP, BELGIUM.**

MANUFACTURERS of complete range of diamond tools and abrasives require well introduced agents in all countries. Please reply in confidence to BOX 2088.

WELL-EDUCATED MAN, with ten years' experience in development, production and marketing of metal diamond impregnated wheels with one of the leading diamond impregnated wheels manufacturers in the country, requires a change. Only executive position considered. BOX 2091.

" THE ITALIAN JEWELED ARTS " by Filippo Rossi, 12 in. x 9 in., 50 pp. text with 42 illustrations, 85 plates in full colour and gold, 8 plates in gold and silver. Covers period 12th to 16th centuries. *" One of the most magnificent books on the jeweller's craft for many years. The illustrations alone make it well worth the price."—GOLDSMITHS JOURNAL.* Price £8 8s. 0d., plus postage 2s 6d, from N.A.G. PRESS, LTD., 226 Latymer Court, London, W.6.

THE DIAMOND NEWS

and

SOUTH AFRICAN JEWELLER

(Official organ of S.A. Jewellers Association, Ltd.)

The Voice of the Diamond Industry

- The only magazine of its kind on the African Continent ; circulates throughout the World, including Russia.
- Many of our supporters are your front-line ambassadors on whose goodwill and co-operation much depend ; reach these potential buyers and sellers through this medium.
- A monthly magazine containing approximately 72 pages of text matter, suitably illustrated.

Subscription Rates, per annum 21/- (Post free)

For information on Rates and spaces available, write :—

Advertising Manager,
P.O. Box 361,
KIMBERLEY,
South Africa.

ADVERTISERS' INDEX

	Page
B.O.A.C.	51
Diamant Boart	43
Diamond News, The	60
Drukker, D. & Zn. N.V.	44
Habit Diamond Tooling Ltd.	Cover III
Henderson Diamond Tool Company, Ltd., The	59
Impregnated Diamond Products Ltd. ...	Cover IV
Indusmond (Diamond Tools) Ltd	41
Industrial Diamond Co. (Sales) Ltd. ...	Cover II
Triefus & Co. Ltd.	Cover I
Wolverhampton Diamond Die & Tool Co. Ltd.	43

o

● PUBLISHERS : N.A.G. PRESS, LIMITED 226 Latymer Court, Hammersmith, London W.6, England Telephone : RIVerside 2143

o

Contributions of scientific, technical and practical interests and news items are invited, but responsibility cannot be accepted for the safety of MSS, drawings, photographs or other matter submitted. Unaccepted matter will be returned.

o

Information of Rates and spaces available for Trade Advertisements will be forwarded on request. I.D.R. is published monthly on the 18th at 1/3 a copy. It is obtainable through Newsagents and Booksellers, or by Postal Subscription, 15s. a year post free, from the Publishers' address above.

Subscriptions in U.S.A $2.50 are received by the usual U.S.A. Subscription Agencies or direct from the Publishers, address as above.

INDUSTRIAL DIAMOND ABSTRACTS

Industrial Diamond Information Bureau,
2 Charterhouse Street, London, EC 1.
Telephone : FLEet Street 1577

1959 Volume 16
MARCH

DIAMOND MINING AND INDUSTRY

The discovery of kimberlites in the region of Kenieba (French Sudan)

Anon. *Chron Mines d'outre-mer* (Paris) 1958 Vol 26 pp 76-79 (Mar) ; *IMM Abstr* 1959 Vol 9 (2) p 44 (Dec-Jan) (Original in French)

Peneplained Birrimian schists are overlain by palaeozoic horizontal sandstones and conglomerates forming the so-called Tamboura Cliff. Both series are intruded by doleritic dykes (in the schists) and sills (in the sandstones). Gold has long been mined from alluvials and terraces all over the Birrimian schists, but diamond was first discovered by chance in October 1954. Subsequent investigation led to the discovery of 4 pipes in the vicinity of Mouralia, 20 km NNW of Kenieba. Kimberlite with low magnesia content, a type of rock that is commonly poor in diamond, was obtained at a depth of 100 m while drilling through the Sekonomata pipe. Heavy minerals in this Kimberlite are : magnesian ilmenite, pyrope garnet, zircon, chromiferous spinels, anatase, calcite ; but no diopside has so far been identified.

Kimberlites in the district bear in fact little diamond. But it is remarkable that stones hitherto found are either very big ones (32-34-98-137 ct) or very small. Stones of common size are very scarce, a fact that remains unexplained.

A new Kimberlitic province has thus been discovered 500 km N of the Sierra Leone province. Pipes intrude indifferently the Precambrian Basement and the Palaeozoic cover. Gravity anomalies are quite distinct and this will be used for further prospecting with Cr and Ni geochemistry. *X* *Ebc.12.36*

Siberian diamonds

Anon. *Mining Mag* 1959 Vol 100 (1) pp 2-3 (Jan)

Reports of the 1958 prospecting season in Siberia are still awaited, but several pipes are believed to have been discovered. The largest diamond so far recorded weighs 54 carats. *W* *Eb.12.332*

Speedy exploitation of Russian diamond fields

Anon. *Gemmologist* 1959 Vol 28 (330) p 18 (Jan)

Development of diamond deposits, 2,400 miles east of Moscow, is going ahead under difficult conditions. *A* *Eb.33:.132*

Brazil : an untapped diamond source ?

R. E. Mieritz. *World Mining* 1959 Vol 12 (1) pp 35-37 (Jan)

Brazil's diamond output constitutes 3% of the world total, and could be increased if more attention was paid to the recovery of small and industrial stones. Over 90% of Brazil's present output is of gem quality. The questions of origin, placers, and exploration and evaluation of deposits are all dealt with. Four mining methods are employed : (*i*) divers recover river gravel by means of pouches ; (*ii*) dredges or draglines ; (*iii*) screen-panning of exposed dry sand-gravel ; and (*iv*) hydraulic mining methods. The marketing of the diamonds is briefly described.

The United Diamond Fields of Brazil have introduced an improved method of sampling soft 'massa' deposits : a 4 in. diameter hole drilling machine—the Calweld earth drill—is used in conjunction with 40 in. casing, in 4 ft sections, and a rotating drilling shoe. The hole is cased as it is advanced. 4 illustr.
W *F.13.346|Hd.346*

Diamond from the sea-bed ? Diamanten vom Meeresgrund ?

Anon. *Gold & Silber* 1959 Vol 12 (1) p 33 (Jan) (In German)

It is reported from Cape Town that the findings of five divers at the mouth of the Orange river were five 1 ct diamonds. It is thought that considerable quantities are to be found there. *A* *Ebc.12.361*

German diamond companies in South Africa ? Deutsche Diamantgesellschaften in Suedafrika ?

Anon. *Gold & Silber* 1959 Vol 12 (1) p 17 (Jan) (In German)

The '*Rhein-Zeitung*', Neuwied, has been informed by a Johannesburg correspondent that German companies have the opportunity of buying, with comparatively small outlays (60,000 to 100,000 DM), newly discovered diamond deposits in the Union of South Africa.
A *Eb.361*

Illegal diggers take 70% of Sierra Leone diamonds

Anon. *Gemmologist* 1959 Vol 28 (330) p 20 (Jan)

Nearly 70% of all diamonds mined in Sierra Leone are being sold illegally. Arrests have been made.
W *F.3672:.2598*

CONTENTS

Diamond Mining and Industry	A37	Rock Drilling	A45
Physical, Chemical, and Mechanical Properties	A38	Wire Drawing	A46
Diamond, etc, in Instruments	A39	Grinding and Polishing of Hard Metals ...	A46
Hardness and Wear Testing	A40	New Machining Methods	A49
Truing of Grinding Wheels	A41	Diamond Recovery	A51
Fine Boring and Fine Turning of Metals ...	A42	Surface Finish Testing	A51
Cutting and Machining of Glass	A44	Miscellaneous	A51
Machining of Stone, etc	A45	Publications Received	A52
		Patent Lists	A53

Mirni — the Siberian Johannesburg ? Mirni — des sibirische Johannesburg ?

Anon. *Gold & Silber* 1959 Vol 12 (1) p 34 (Jan) (In German)

In Yakutia, North-East Siberia, a new diamond city is springing up — the city of Mirni. The largest diamond found there so far weighed 33.5 ct, the majority of the stones being industrials. The suspicion that Siberian earth was diamond-bearing stems from the years before the 2nd World War. Keen searches have been made since 1948.

A *Eb.332*

Diamonds in the news

Anon. *SA Min & Engg Journ* 1959 Vol 70 Pt 1 (3439) p 37 (Jan 9)

More details of diamond recovery methods in Russia are being released. The principal obstacle to mining is the frozen ground which has to be heated before digging can begin. *W* *Hd.33*

Recovering diamonds from sea & river

Anon. *Gemmologist* 1959 Vol 28 (330) p 5 (Jan)

Mr. J. Vivier, of Suidwes Prospekteerders Eindoms, believes in the existence of 'plenty' of diamonds on the ocean bed. Divers have recovered 5 stones, each in the region of 1 carat. Mr. B. Goldberg has built about 30 breakwaters in the Vall River to aid the recovery of diamonds.

W *Ebe.12.361*

Birth of a gem industry

Anon. *SA Min & Engg Journ* 1958 Vol 69 Pt 2 (3436) pp 1263, 1265 (Dec 19)

The story of Consolidated Diamond Mines of SWA.

W *Hd.362:.28*

Alluvial diamond returns for October 1958

S African Mines Dept. *Diamond News* etc 1958 Vol 22 (3) pp 33-34 (Dec)

Rough and uncut diamond production in September 1958 for Cape Province : 5,206.50 ct of total value £47,625 (182s 11d per ct) ; Transvaal Province : 9,465.50 ct of total value £35,475 (74s 11d per ct). Thus total production amounted to : 14,672 ct of total value £83,100 (113s 3d per ct).

M *Ebe F.13.361*

Tanganyika diamond exports

Tanganyika Dept Mines. *Diamond News* etc 1958 Vol 22 (3) p 31 (Dec)

Exports for October 1958 : 37,403 ct of total value £254,116 (146s 1d per ct). Total exports for January to October 1958 : 418,368 ct of total value £3,553,182 (83s 3d per ct). Corresponding exports for October 1957 : 49,888 ct of total value £411,958 (80s 10d per ct). Total exports for January to October 1957 : 297,297 ct of total value £2,658,395 (178s 10d per ct).

M *F.251.364*

Economic use of the Yakutsk diamonds

V. N. Mokienko. *Stanki i Instr* 1958 Vol 29 (12) pp 31-32 (In Russian)

Some dimensions of Soviet diamond grinding wheels are shown.

W *F.332:.251/Nv.33:.215*

Preparing diamond for the market

P. L. Jadia. *Min Wealth Madhya Pradesh* 1958 Vol 1 pp 48-51 ; *Bibl Sci Publ S & SE Asia* 1958 Vol 4 (12) col 346 (Dec)

X *Hh*

The country of gemstones

L. Gray. *Gemmologist* 1959 Vol 28 (330) pp 6-8 (Jan)

A general account of Brazil's gem industry. From a gemstone map of Brazil it can be seen that diamonds are found at Piaui, Bahia, Minas Gerais, and Parana, all areas in the eastern and southern regions of the country. 1 illustr. *W* *Bb.364/F.364*

Africa's geology and mineral wealth. Geologie und Bodenschaetze Afrikas

E. Krenkel. *Erdoel & Kohle* 1958 Vol 11 (12) p 898 (Dec) (In German)

Book, Akademische Verlagsgesellschaft Geest & Portig KG, Leipzig. 1957, 2nd ed, 597 pp, illustr. Price : DM 61.--. [Not in library of Ind Diamond Inf Bur]. *A* *Vw.36.52*

The diamonds of Yakutia. Il diamanti della Jacuzia

Sofinformburo. *Industria Mineraria* 1958 Vol 9 Ser II (11) pp 701-702 (Nov) (In Italian)

Searching for diamonds in Russia has gone on for more than 100 years. The discovery of rich diamondiferous strata during the last 10 years makes the development of a strong diamond mining industry in Russia a future possibility.

M *Eb.332:.12*

PHYSICAL, CHEMICAL, & MECHANICAL PROPERTIES OF DIAMOND AND OTHER HARD MATERIALS

Some scintillation characteristics of diamond under alpha particle bombardment

J. E. Ralph. *Phys Soc Proc* 1959 Vol 73 Pt 2 (470) pp 233-238 (Feb 1)

In the work described a new approach to the problem of the detailed structure of natural diamonds has been developed, using single diamonds as scintillation counters for alpha particles. The apparatus used was in the form of a conventional scintillation spectrometer. The diamond and the polonium alpha-particle source were contained in an evacuated chamber with the crystal in contact with a glass window. The photomultiplier (EM/6094) had its cathode in contact with the other side of this window to give a light collection solid angle of a little less than 2π. The output of the photo-multiplier was fed through a cathode follower to a wide-band amplifier, and the output of this was passed to a pulse-height analyser and a scaler. The alpha-particle energy could be varied, and the bombardment directed on a limited region of the crystal surface if desired. Sharp cut-off filters were used to estimate the wavelength range of the emitted light, and a neon lamp pulsed by a flip-flop circuit replaced the alpha source in the determination of the pulse height dispersion due to the photomultiplier.

Specimens of types I and II diamonds were used. The scintillation pulse height spectra were examined for 35 natural diamonds, and the mean pulse heights and dispersions were found to be largely uncorrelated with the type I and II classification. After-pulses of about 50 m sec duration were observed for all specimens, and their variation with particle energy was investigated. 4 illustr, 5 ref. *A* *F Qv Ul*

Corundum [:] natural versus synthetic

E. R. Varley. *New Commonwealth* 1959 Vol 37 (1) pp 36-38 (Jan)

5 illustr, 2 tables. *X* *Bbc*Bkb*

'Improved diamonds'—a U.S. warning

Anon. *Gemmologist* 1959 Vol 28 (330) p 18 (Jan)

A warning is given about the sale of 'off-colour' diamonds improved artificially.

W *FHx Uk.2532.342*

How to judge the value of a jewel

M. Bagot. *Réalités* 1959 (99) pp 35-39 (Feb) (In English)

A large part of the article is devoted to diamond, its occurrence in dry mines and alluvium, the weight, lustre, and colour of good and bad stones, and the manner in which they may be cut as gems. 6 illustr.

A *Kb/Tg*

The 'Blank' gem testing lamp. Die 'Blanksche' Edelsteinprueflampe

H. Blank. *Gold & Silber* 1959 Vol 12 (1) p 9 (Jan) (In German)

As no known method of distinguishing gems from synthetic stones is reliable, a lamp for testing by means of ultra-violet rays has been constructed. The advantages of this method are: immediate readiness for use when the current is switched on; controlled heat, so that in tests lasting hours there is no overheating; the lamp can be switched on again for use without an interval for cooling. The stone to be tested is laid between a synthetic and a natural stone, and the fluorescent effect compared with the two. 1 illustr.

A *Vwdb Wd*

O Carbonado

A. P. Guimaraes. *Gemologia* 1958 (11) pp 9-16; *Journ of Gemmology* 1959 Vol 7 (1) p 11 (Jan) (Original in Portuguese)

An account of the cryptocrystalline type of industrial diamond found in Brazil and known as carbonado. A general account of the material, its relationship to boart and to gem diamond and particular reference to the uses to which this valuable material is put.

X *Ff.346*

Clarity

W. C. McConahay. *Gems & Gemology* 1958 Vol 9 (6) pp 174-179, 190 (Summer); *Journ Gemmol* 1959 Vol 7 (1) p 12 (Jan)

The article outlines a suggestion that the usual method of grading diamonds tends to negative thinking, and the author proposes another approach which avoids the issue and can yet be ethical. The author does not claim that he has solved the problem but rather to have posed a question.

X *F Hk*

Differential thermal analysis of irradiated diamond and silicon carbide

W. Primak (Argonne Nat Lab). *US Govt Res Rep* 1958 Vol 30 (4) p 315 (Oct 17)

ANL-5249 (photostat $4.80, microfilm $2.70) available from Library of Congress, Photoduplication Service, Publications Board Project, Washington 25, DC.

W *Bz Qv Ud/F Qv Ud*

The etching of diamond

S. Tolansky. *Diamant* 1958 Vol 1 (2) pp 14-15 (May) (In English, Flemish, and French)

Following a brief discussion of earlier work on etching diamond, a short description of recent work is given. A hot potassium nitrate etch on diamond begins at 475 deg Centigrade. 2 illustr.

W *F Ql Ubm*

Cemented [sintered] carbide tools

Thomson-Houston Co Ltd; Alfred Herbert Ltd. *Machine Shop Mag* 1959 Vol 20 (2) p 126 (Feb)

A new grade of carbide, Ardoloy AK, has improved resistance to breakage under adverse intermittent cutting conditions. It is particularly suitable for heavy operations where large stock removal is necessary, *eg* heavy planing and plano-milling. The average range of cutting speeds, *ie* 150 to 250 ft/min on steel, can be extended to encompass 80 to 350 ft/min speeds. 1 illustr.

W *Bfd Cff Pdc Unl*

Swiss P 332,126 **J. F. H. Custers, H. B. Dyer, R. W. Ditchburn, Industrial Distributors (1946) Ltd** (Apr 19, 1954—conv date, South Africa)

Method for improving the colour of pale yellow or brown diamonds. Verfahren zur Verbesserung der Farbe fahlgelber oder brauner Diamanten

The diamond is subjected to an irradiation influencing its crystalline structure so as to increase its absorption capacity towards the red end of the visible spectrum. If the crystal lattice is changed so that the original too high absorption in the violet range is exactly compensated along the whole length of the visible spectrum, then the initially yellow or brown stone becomes discoloured into a valuable colourless stone. This ideal obviously cannot be attained, but a brightening or suppression of the brown or yellow colour by a superposed absorption at the opposite end of the spectrum discolours the stone or changes its colour. Irradiation may be effected by bombardment with particles of the atom, *eg* electrons or slow neutrons, or the diamond may be subjected to gamma rays which penetrate the crystal lattice and change the arrangement of the atoms. Positrons may also be used. For example, the diamond may be bombarded by electrons of an energy between 0.4 and 1.0 MeV. The practical threshold of this type of radiation is approximately 0.4 MeV. As a source of radiation, radioactive cobalt may be used, or radioactive caesium. If the diamond was exposed to too strong a radiation it can be restored by heating it to a temperature of 450 deg Centigrade. (17 claims).

J *F Hx*

DIAMOND, ETC, IN INSTRUMENTS

Electron microscopic studies on thin metal sections cut with diamond knives. Elektronenmikroskopie an Metallduennschnitten mit Diamantmesser

L. Reimer. *Zeits Metallkde* 1959 Vol 50 (1) pp 37-41 (Jan) (In German)

An ultramicrotome with a diamond knife has been developed, which has the advantage, for the biological application of ultramicrotome techniques, that the knife does not need regrinding over a long period of time. It has been proved possible to produce thin slices, even of germanium, with a thickness between 100 and 300 AU. The thin slice method of microscopic examination enables compact material to be cut directly and penetrated with electrons. In the experiments performed, the best cutting results were obtained with a cutting edge 0.01 to 0.1 mm long, and the operation was watched through a strong binocular microscope. Eight different metal samples were cut. As a rule, cutting was continued until overheating occurred. Tests were made with pure metals in order to find the influence of the cutting on the structure. The apparent structure as seen through Bragg reflexion on the network is discussed, as are the possibilities that arise from using sections instead of replicas. 11 illustr.

A *Bfa Ceg Nfn Vjg/Bz Ceg Nfn Vjg*

The production of ball and roller bearings

Hoffmann Mfg Co Ltd. *Machinery* (London) 1959 Vol 94 (2410) pp 120-131 (Jan 21)

On one roundness testing device, a hemispherical stylus of sapphire is used. A rotary Pilotor is employed for investigating the surface finish and geometry of the tracks of inner and outer races; this uses a 90° cone diamond tracing stylus with a 0.0005 in. tip radius. 13 illustr.

W *Az Cx Ndc*

[Sapphire in a relief valve]

Linde Co, Div of Union Carbide Corp, Crystal Products Dept, 300 Madison Ave, New York 17, NY. *Compr Air Mag* 1958 Vol 63 (11) p 32 (Nov)

Sapphire is used in the ball poppet of a relief valve designed to allow pressure to escape from a tank in a space vehicle, and sapphire is also being applied to hot gas or acid valves. The advantages which caused this stone to be used were its extreme hardness, chemical inertness, high temperature strength, and dimensional accuracy. Sapphires manufactured by this company are used as windows and domes in infrared optical systems and for similar purposes.

A *Psn Rjf*

HARDNESS AND WEAR TESTING

Hardness tester can reach normally inaccessible places

Ingersoll Locks Ltd, 91 Moorgate, EC2. *Ind Equipt News* 1959 Vol 8 (2) p 39 (Mid-Jan)

Particularly suitable for testing grooved or barrelled rolling mills of 5 in. diameter and above, this instrument can make tests in grooves of 2 in. width or more to a depth of 7 in., or on flat surfaces which are normally difficult to test for hardness, such as the machine beds of lathes.

The unit has a 3½ in. objective and indenter fitted to a remote controlled sliding turret. Diamond pyramid tests can be made up to 30 kg loads, the range of hardness covered being from 150 to 1,100 DPH. Besides diamond pyramid indenters, steel balls can also be used. A magnetic clamp device can be adjusted to any diameter or used on any flat surface. A chain clamp can be provided to enable tests to be made on non-ferrous metals. 1 illustr.

A *Cvd Wghc*

Effect of lubricant on penetration of a diamond-pointed indenter into ductile metals

V. D. Kuznetsov, A. I. Loskutov. *Fizika Metallov i Metallovedenie* 1956 Vol 2 (3) pp 509-513; *Brutcher Transl* 1958 (4406) 8 pp (Original in Russian)

A study was made of the dependence of the depth of penetration of a diamond indenter into ductile metals in the presence of lubricants. Measurements were made with an apparatus having a maximum load of 200 g, with a lever arm with a 1 : 7.8 ratio for applying greater loads. At fairly high loads, depending on the hardness of the metal, the depth of penetration of the indenter was greater than the depth of indentation having regular geometric outlines, thus giving an irregular polyhedron indentation. Measurements on copper, zinc, and 0.04% carbon iron were made without lubricant, and with vaseline oil, and with 0.2% solutions of oleic and stearic acids in vaseline oil. The 60 × 30 × 10 mm specimens were carefully prepared, and the diamond was cleaned when changing lubricants. The results are shown on graphs. Earlier work of a similar nature is discussed. 3 illustr, 6 ref.

W *Bf Cvd Nd Qr Sk*

Hardness testing

G. H. Jackson. *Met Treatment* 1959 Vol 26 (160) pp 28-30, 32 (Jan)

Elasticity and static and dynamic tests are discussed, and difficulties arising from the 'mass effect' are pointed out. After many earlier experiments, tests were finally reduced to a choice between Brinell, Rockwell, and 136° diamond methods, of which the Rockwell gained particular popularity, principally because of the speed at which tests could be made. Brinell was rarely used for the testing of material harder than 450 BHN; after that, a diamond was considered essential.

The precautions necessary to secure consistent Brinell results are summarized, and the basic principle of the Rockwell test is stated. The variety of scales in use for Rockwell testing make the process very versatile, the most well-known scales being the C scale, which uses a diamond cone, and, perhaps used less frequently, the A scale with a 60 kg load and 120° diamond, as used for testing sintered carbides and other extremely hard materials.

The 136° diamond pyramid hardness method follows the Brinell principle, in that a shaped indenter is pressed into the surface under test with a suitable load, after which the diagonals, instead of a diameter, are measured, and the hardness number calculated by dividing the load by the surface area of the indentation. The loads applicable on the Vickers machine in this method are from 1 to 120 kg. The apparatus for this type of testing must be designed to apply a steady load without any impact and with the minimum possible friction of parts, so that the actual load on the indenter is correct to less than 1%. The readings are in microns and are made by means of an ocular micrometer.

A *Cvd Wghc*

Low-load hardness tester. Kleinhaertepruefer

Anon. *Ind Anzeig* 1959 Vol 81 (4) pp 18-19 (Jan 13) (In German)

The machine is able to make Vickers, Knoop, and scratch hardness measurements on small parts and thin plates or sheets. The diamond impression is invisible to the naked eye, owing to the low load, and the accuracy is such that impressions can be made, with the help of the microscope, on cutting edges, watch axles, and fine points. The diamond is protected from being knocked and chipped. The load is from 15 to 2,000 grammes. Measurements of impressions are made to an absolute accuracy of 0.5 micron, the relative accuracy being 0.2 micron. The largest possible workpiece is 150 mm, but the machine can be swivelled on its column to examine the workpiece from all angles. 1 illustr.

A *Cvd Wghc*

Wear studies on nonmetallic bearing materials

R. O. Bolt, J. G. Carroll (Calif Res Corp). *US Govt Res Rep* 1958 Vol 30 (5) p 392 (Nov 14)

PB 133498 (photostat $4.80, microfilm $2.70) describes test work to determine the suitability of various combinations of nonmetallic bearing materials and metallic shafts for use under water at temperatures of 500 deg Fahrenheit. Available from Library of Congress, Photoduplication Service, Publications Board Project, Washington 25, DC.

W *Psn Unr*

Wear and friction of materials on the pendulum slide machine

N. B. Dewees (Westinghouse Electr Corp). *US Govt Res Rep* 1958 Vol 30 (5) p 473 (Nov 14)

WAPD-CTA(ED)-18 (photostat $7.80, microfilm $3.30) available from Library of Congress, Photoduplication Service, Publications Board Project, Washington 25, DC.

W *Cw*

Vickers hardness and compressive strength

D. S. Dugdale. *Journ Mech & Phys Solids* 1958 Vol 6 (2) pp 85-91

Hardness and compression tests are reported for a wide variety of materials. A simple empirical method for relating hardness number to the stress-strain curve is suggested. The correlation obtained leads to the conclusion that the Vickers test is not at all sensitive to yield stresses corresponding to compressive strains greater than 0.15. 5 illustr, 7 refs, 1 table.

A *Cvd*

Reducing scuffing and wear of ferrous metals

F. D. Waterfall (ICI Ltd). *Engineering* 1959 Vol 187 (4846) pp 116-120 (Jan 23)

A description of the Sulfinuz process in which the surfaces of ferrous metals are impregnated with sulphur and nitrogen to increase their resistance to scuffing and wear. Results obtained are compared with those produced by phosphating and other processes. An Amsler wear testing machine was used for making wear measurements. 13 illustr.

W *Bfc Cw/Bfc Qmb Unr*

Applications of ceramic cutting materials and causes of wear of hard metal tools

H. Opitz. *Microtecnic* 1958 Vol 12 (5) pp 267-288 (Oct) (In English)

37 illustr, 24 ref, 6 tables.

X *Pdc Unr/Pdd*

TRUING OF GRINDING WHEELS

Dressing thread grinding wheels

Anon. *Tool Eng* 1959 Vol 42 (1) p 92 (Jan)

In instances where the thread to be formed on a wheel is bounded by straight lines or modified buttress threads, separate diamond tools are mounted either on a pivot or a slide, so that several tools may traverse the different surfaces of the wheel. These diamond points may be moved in a straight line, *eg* by being supported on respective slides, or they may be mounted on a pivot to traverse accurately the wheel surface to be formed. Separate diamonds are provided for forming opposite flanks of the wheel rib, and the points should only be in cutting contact while traversing the rib from the apex towards its base, and should return out of contact with the wheel.

A *Abmb Cg Nj*

Apparatus for profiling grinding wheels. Schleifscheiben-Profiliergeraet

Anon. *Ind Anzeig* 1959 Vol 81 (1) pp 7-8 (Jan 2) (In German)

The accurate profiling of a grinding wheel is carried out by means of a pantograph system, a template holder, and holders for truing diamonds. As the profiling apparatus makes truing easier, softer grinding wheels may be used thus minimizing heating and roughness of the finished surface. In profiling hardened steel, a tolerance of ±0.005 mm can be obtained with this apparatus. Two other profiling attachments are described. 3 illustr. *A* *Ab Chch Pr Ps*

Dresser for portable grinders

W. Dressel. *Metalworking Prodn* 1959 Vol 103 (4) p 157 (Jan 23)

Describes a star-wheel dressing set-up for portable grinders. *W* *Qec:Pj*

Diamond dressing tools

Anon. *Tool Eng* 1959 Vol 42 (1) pp 91-92 (Jan)

A new standard, ASA B67.1, for shank dimensions of diamond tools used for dressing or truing grinding wheels has been established. Diamond tools requiring special shaped diamonds are not specifically covered by this standard, although they could conform to the standard in many ways.

The diamond, together with the shank and head which holds it by contact, is the 'diamond tool'. Words to indicate use may be inserted, *eg* 'diamond dressing tool', 'diamond turning tool'. The fixture by which the diamond tool is held in the machine while in use is called the holder. Standard dimensions for straight shank and headed shank tools are given.

Diamond dressing [truing] tools may contain either natural or shaped diamonds. These tools are used for dressing [truing] or forming grinding wheels and comprise the first major class. They may be either single or multiple point. Multiple diamond dressing tools fall into three classes: single layer tools which contain diamonds set on one plane; multiple-layer tools which contain diamonds set in several layers with the matrix; and impregnated diamond tools which contain diamonds not set in a pattern throughout the matrix.

The other major classifications of diamond tools are diamond boring and turning tools, which contain a diamond shaped to a specific form for use in boring and turning operations, and miscellaneous diamond tools, such as diamond gauge and contact points, hardness testing tools, and glass cutting tools. Designation symbols are given. 2 illustr, 2 tables.

A *Nj.255*

Effect of variations in wheel dressing

Anon. *Grinding & Finishing* 1959 Vol 4 (9) p 45 (Jan)

The grinding action of a wheel can be varied by altering the rate of diamond traverse across the wheel face during truing. Variables which effect a change in wheel performance include the diamond nib radius and the amount of infeed.

W *Ab Cg Nj*

Crush form simple contours

H. J. Gerber. *Grinding & Finishing* 1959 Vol 4 (9) p 35 (Jan)

A simple method of crush forming grinding wheels with friable bonds is described.

W *Ab Chcb*

Automatic grinder 'Hirth' for internal grooves. Rettificatrice automatica per interni scanalati 'Hirth'

Hirth AG. *Macchine* 1958 Vol 13 (1) pp 83, 85 (Jan) (In Italian)

Includes description of diamond truing device for forming grooves on grinding wheels. 1 illustr.

M *Ab Cgf Nj*

Accurate wheel dressing of combined radii and angles

R. & A. Tool & Engg Co, 7338 Woodward Ave, Detroit 2, Mich. *Grinding & Finishing* 1958 Vol 4 (8) p 47 (Dec)

The Zenith form truer can true any radius or tangent in one set-up, without moving the truer. All movements of the diamond are claimed to be dead accurate. 1 illustr. *W* *Cgf Nj*

LITERATURE REQUESTS

When applying for the loan of literature abstracted in this journal, please quote the title of the article, the name of the author, and the number of the page on which it appeared.

Brake cylinder boot provides abrasive protection
J. D. Thackrey, Pasadena, Calif. *Am Machinist* 1959 Vol 103 (1) p 137 (Jan 12)

Brake-cylinder boots, available from 3/16 to 1 5/16 in. OD, can be used to protect from wear those tools which are used near grinders. A sketch illustrates a diamond truer using a section of a boot to protect moving parts from the abrasive.
W *Pz*

BP 807,401 (May 12, 1954) **H. S. Hallewell**
Mounting for forming means for profile grinding wheels

The mounting shown in Fig 1 is built up on base 10 on sole plates 11 resting on table 12 of a surface grinding machine. Carriage 15 is slidable towards and away from grinding wheel 23 on two parallel rods between upstanding lugs 14 adjusted by handwheel 19.

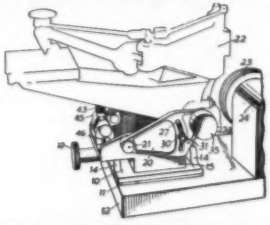


Fig 1. A new mounting arrangement for a forming device for profile grinding wheels. BP 807,401.

Frame 20 (one side visible) is swingable about pivots 21 and adjusted along arcuate slots 27 by rack and pinion, and clamped by nuts 30 to bring diamond point 22a on truing device 22 into correct position. The truing device is shiftable parallel to the axis of wheel 23 by a micrometer arrangement through handwheel 35. The weight of the truing device is carried by telescopic strut 43 on yoke 45. (3 claims, 3 illustr).
J *Abm Cr:Cqf Nj Pr*

Swiss P 332,922 **National Cash Register Co** (June 17, 1955—conv date, USA)
Method for profiling a grinding wheel and device for carrying out this method. Procédé de profilage d'une meule et dispositif pour la mise en oeuvre de ce procédé

The profile is impressed on the grinding wheel by a profiling wheel which in turn is provided with the reverse profile by a pantograph controlled diamond tool. The profiling wheel is made of aluminium oxide for a resin-bonded diamond wheel. Grinding wheel and profiling wheel rotate in the same direction, but the grinding wheel 500 to 630 times faster than the profiling wheel. Two selectively operable drive mechanisms are provided for the profiling wheel and for the grinding wheel. (5 claims, 1 illustr).
J *Ab Chch Pe/Abm Ceqg Nf*

FINE BORING AND FINE TURNING

Cutting-tool materials—today and tomorrow
R. T. Hook (Warner & Swasey Co). *Machinery* (NY) 1959 Vol 65 (5) pp 116-119 (Jan)

Reviews the prospects for HSS, tungsten carbide, titanium carbides, ceramics, titanium boride, and sintered diamond particles. Of the latter it is said that no suitable binder is known at present. 1 illustr, 2 tables. *W* *Nf/Pdb/Pdc/Pdd*

Tungsten carbide tools on automatic lathes. Outils en carbure de tungstène sur tours automatiques
British Timken Ltd. *Machine Mod* 1959 Vol 53 (599) pp 21-24 (Feb) (In French)

Machines made by Acme-Gridley (4 spindles), Wickman (4 spindles) and New-Britain (single-spindle) especially constructed for working with tungsten carbide tools, and a special single-spindle machine made by Timken Roller Bearing Co, are described. A special machine made by the Oliver Instrument Co is used by the Timken company for sharpening surfacing and reaming tools. It has a special diamond truing device, whereby the diamond holder is rotated round a pivot at the carriage base having been set in accordance with the wheel to be trued. During the truing, the whole of the vertical carriage can be moved backwards, round a pin at the base. A special diamond holder is also provided for truing the face of the conical wheel which is used in forming the template. The head of the wheel spindle can be moved in a transverse direction to allow the truing to proceed. 7 illustr.
A *Al Bkcb Chc Pr*

Enamel question No 130 : Is it possible to drill holes into enamelled castings ? Emailfrage Nr 130 : Kann man in emaillierte Gussteile Loecher bohren ?
Anon. *Glas-E-K-Technik* 1959 Vol 10 (1) pp 39-40 (Jan) (In German)

A reader's question concerning drilling holes in enamelled parts is answered with recommendations for sintered-carbide thread drill bits and ultrasonic drilling methods. Speeds, angles, and tool dimensions are given. *A* *Bmk Cfb Pl Rh/Bmk Cfbk*

Special turning tools for precision drilling operations. Fuer Feinbohr-Operationen bestimmte Ausdrehwerkzeug
Anon. *Technica* 1959 Vol 8 (2) pp 63-65 (Jan 16) (In German)

The different stages in drilling operations fall into five groups : centring (except in the use of a drilling instrument) ; rough drilling with a twist drill ; scouring with multi-tip drills or internal turning tools ; finishing with a reamer or tapping tool ; and precision finishing with a precision turning tool. Examples of different tools for performing these operations are given. 8 illustr. *A* *Cfb Pd*

Machining with ceramic oxide cutting materials. Zerspanung mittels oxydkeramischer Schneidstoffe
Anon. *Technica* 1959 Vol 8 (1) pp 5-10 (Jan 2) ; (2) pp 71-76, 82 (Jan 16) (In German)

The chemical and physical properties of ceramic oxide materials and the manufacture of tools from this substance are described in detail. Correct tool geometry is discussed.

Rules are given for turning with ceramic oxide cutting inserts. The occurrence of wear in these and grinding the chip steps and cutting edges on such tools are described. Examples of work performed are given in detail. A final section is devoted to milling with the help of ceramic oxide cutting materials. 37 illustr, 21 ref, 6 tables. *A* *Pdd Uqb*

Single and multi-spindle horizontal and vertical fine boring machines
Anon. *Progressus* 1958 Vol 39 (1) p 12 (Feb)

Fine borers designed for high precision production in the automotive, aircraft, and general engineering industries are reviewed briefly. 6 illustr.
A *Cfdb Pr*

High speed machining with disposable inserts

C. S. Currie jun. (Gen Electr Co). *Machinery* (NY) 1959 Vol 65 (5) pp 95-96 (Jan)

2 illustr. *W* *Ceq Pdcb*

Method of cutting and economic performance of ceramic turning tools. Tenue de coupe et rendement économique des outils de tournage céramique

W. Dawihl, E. Klingler. *Machine Mod* 1959 Vol 53 (598) pp 41-46 (Jan) (In French)

In the description of the upkeep of ceramic turning tools a paragraph is devoted to truing. This is frequently done with silicon carbide wheels, but is also done by diamond wheels which can produce a surface down to a 6 micron finish. 9 illustr, 25 ref, 5 tables.

A *Al Bl Cg Nv/Ceqb Pdd.138*

Abrasion with sintered carbide tools. Das Reiben mit Hartmetallwerkzeugen

H. Haidt. *Industrieblatt* 1958 Vol 58 (12) pp 557-563 (Dec) (In German)

Instructions are given at length for the best conditions of cutting, the most appropriate types of tool for different work, and the choice of sintered carbide. 10 illustr, 3 ref, 5 tables. *A* *Ceq Pdc*

Set-up for turning bicycle spindles on a Herbert-Small-piece multi-cut lathe

Alfred Herbert Ltd, Coventry. *Machinery* (London) 1959 Vol 94 (2413) pp 322-323 (Feb 11)

Ardoloy tools are used for copy turning bottom bracket spindles for bicycles. A radius forming operation is carried out at the same time as the profiling operation. 2 illustr.

W *Az Ceq Pdc/Cg Pf Psfc*

Carbide vs carbide

R. T. Hook. *Automatic Machining* 1958 pp 45-46 (Oct); *PERA Bull* 1959 Vol 12 (1) p 13 (Jan)

Particulars demonstrating superiority of 'new premium grade carbides' in turret work.

X *Pdc*

Production turning—with ceramics !

J. B. Pond. *Carbide Engg* 1959 Vol 11 (1) pp 10-15 (Jan)

7 illustr. *W* *Ceqb Pdd*

Hardened bearing races machined with cemented [sintered] oxide tools

H. J. Siekmann (Gen Electr Co). *Machinery* (NY) 1959 Vol 65 (5) pp 109-111 (Jan)

4 illustr. *W* *Az Ceq Pdd*

Equipment requirements for high-speed machining

H. J. Siekmann (Gen Eectr Co). *Tool Eng* 1959 Vol 42 (1) pp 49-52 (Jan)

Characteristics required in machine tools for use with ceramic tools are outlined. The machines require greater stability than those used for carbides which require only a quarter of the cutting speed necessary for ceramics. 4 illustr.

W *Ceq Pdd Pr Unw*

Turning with ceramic tipped cutting tools. Tornitura a reproduzione con utensili a placchetta di materiale ceramico

H. Renker. *Macchine* 1959 Vol 14 (1) pp 51, 53, 55, 57 (Jan) (In Italian)

Among properties most important in these tools are their hardness and high modulus of elasticity. 6 illustr.

M *Ceq Pdd*

Completely carbide

R. C. Morgan. *Automatic Machining* 1958 pp 37-39 (Oct); *PERA Bull* 1959 Vol 12 (1) p 13 (Jan)

Greatly increased production shown between regrinds. Use of a drill without chisel edge described.

X *Cfb Pl Rh Uqb*

Turning alloy steels with ceramic and carbide tools

PERA, Melton Mowbray, Leics. *Machinery* (London) 1959 Vol 94 (2413) pp 325-335, 341 (Feb 11)

Details are given of investigations carried out to determine and compare the performance, in terms of tool life and surface finish, of various 'clamped on' ceramic and carbide tips when turning alloy steels with ultimate tensile strengths within the range 45 to 65 tons/sq inch. British and American tips were used. 15 illustr, 6 tables.

W *Bfd Ceqb Pdc*Bfd Ceqb Pdd*

BP 806,612 **Raytheon Mfg Co**

(Feb 25, 1955—conv date, USA)

Machine tools and methods of machining

Automatic control of the contact force between work-piece and (drilling) tool is obtained by keeping the tool point under an adjustable predetermined force in a datum position which controls the feed of the work-piece towards the tool. Fig 2 is a perspective view of a machine in which 33 is the work to be drilled enclosed in a slurry tray 44. Under cover 42, as shown in Fig 3, is arranged a supersonic drill arrangement with transducer 13 and drill end 34 over work 33. The drill

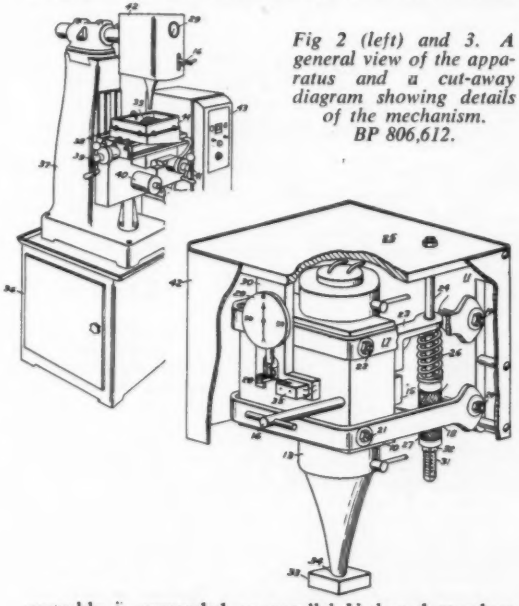


Fig 2 (left) and 3. A general view of the apparatus and a cut-away diagram showing details of the mechanism. BP 806,612.

assembly is suspended on parallel U-shaped members 17, 18 mounted in ball-bearing pivots 19, 20, and vertically adjusted by nut 27 under spring 26 of known stiffness. The correct adjustment is indicated by zero on dial gauge 29. The feed may either be manually controlled by the operator, keeping the indicating needle as near as possible to zero, or it may be continuous and automatic using switch 35 for starting or stopping an electric feed motor through control 40 when the dial gauge reads ±50 mil. (14 claims, 4 illustr).

J *Cfbk Pr Uql Wp*

Swiss P 333,432 (Mar 3, 1954) **A. Richter, H. Weber, W. Wolf**

Method of producing tools for chip producing or chipless machining, and tool produced by the method. Verfahren zur Herstellung von Werkzeugen zur spanenden oder spanlosen Bearbeitung und nach dem Verfahren hergestelltes Werkzeug

The method concerns tools consisting at least partly of a ceramic mass of sintered metal oxides. Known ceramic oxides are bad heat conductors and electrically insulating materials, they are brittle, have bad sliding properties, wear easily down to powder when subjected to higher pressures, and their edges are easily damaged. However, they are hard and high temperature resistent. Their mechanical properties can be improved by the addition of metals or organic materials or so called glass phases. Mixtures of fine grained aluminium oxide with 20 to 40% iron powder or magnesium fluoride are known for cutting and grinding tools. So called 'diamond metals' contain copper alloys, iron-nickel, iron-nickel chromium, tungsten carbide-cobalt, tungsten carbide-titanium, carbide-cobalt, or other tungsten and molybdenum alloys dependent on the desired wear resistance. In order to improve toughness, frictional properties, wear, heat conductivity, and especially edge resistance, so as to enable the use of such cheaper materials for tools otherwise made of metals of high value, certain additions are made to the ceramic oxide mass, *ie* 10% carbon or up to 20% metals, or metal carbides, or mixtures of metals and metal carbides. The mass and its additions are sintered in an oxide free atmosphere at 1,400 to 2,000 deg Centigrade. (11 claims). *J* *Pdd Un Utb*

CUTTING AND MACHINING OF GLASS

Glass question No 264 : Does the temperature at which glass surfaces are ground and polished play a large part ? Glasfrage Nr 264 : Beim Schleifen und Polieren von Glas spielt wohl die Temperatur, bei der diese Glasveredelungen vorgenommen werden, eine grosse Rolle ?

Anon. *Glas-E-K-Technik* 1959 Vol 10 (1) p 35 (Jan) (In German)

In answer to a question put by a reader, observations are made as to the influence of temperatures and cutting times. The polishing process is distinguished from the grinding as being a smoothing process with a finer grain of abrasive, while the grinding is a roughing process as the abrasive tears grains away from the workpiece leaving a rough surface. In the grinding process temperature has little influence, although high temperatures are produced at the point of contact of glass and abrasive. In polishing, however, the temperature is of importance, being closely connected to the degree of abrasion. The higher the temperature, the more glass is removed. The greatest influence is exercised from 5 to 20 deg C (room temperature), for the amount of abrasion almost doubles at this point. After that the curve gradually flattens out. A table shows results obtained with a standard polishing agent of αFe_2O_3 in 1500 cub cm of water, with additions of varying quantities of $FeSO_4$, and, in some cases, also HCl or H_2SO_4. 5 ref.
A *Bm Chc/Bm Chm*

LITERATURE REQUESTS
Please quote the page number of the Bibliography containing the original reference, and the author and title of the article, in all cases.

Highlights of scientific glass blowing

V. C. de Maria. *Glass Ind* 1958 Vol 39 (12) pp 643-646, 662, 664-666, 668-689, 671 (Dec)

The development of present methods of glass-blowing, including the glass blowing lathe, are discussed in detail. In optical glass working from the invention of spectacles in 1317, the microscope in 1590, and the telescope in 1609, progress has continued, bringing improved methods of cutting, drilling, grinding, and polishing glass. In the manufacture of round joints and stop-cocks, grinding is accomplished on a single-head lathe. Another machine uses wet abrasive belts. Diamonds were used for cutting glass in France as early as 1500. Continuous improvements for securing the diamond particles resulted in the metal-bonded diamond drills and cut-off wheels now used. 14 illustr, 19 ref.
A *Bm C W*

The influence of the roughness of lens surfaces on the image transfer factor. Der Einfluss der Rauhigkeit von Linsenoberflaechen auf den Uebertragungsfaktor

E. Diederichs, A. Lohmann. *Optik* 1958 Vol 15 (12) pp 751-757 (Dec) (In German)

The polishing defects of optical surfaces are statistically distributed and small in area and depth. It is shown that in this case the frequency response function may be split into the product of two frequency response functions, the first resulting from the usual aberrations and diffraction, the second depending on the mean depth of the polishing defects. 3 illustr, 14 ref.
A *Tf Uk Unf*

Longer life for reflex gauge glasses

W. R. Hoes (Richard Klinger Ltd). *Engineering* 1959 Vol 187 (4843) p 31 (Jan 2)

Changes in boiler operating conditions have tended to reduce the life of reflex gauge glasses, and methods of minimizing adverse effects are suggested. Jointing surfaces can be refaced by grinding with silicon carbide and paraffin. *W* *Bm Chc Rdc Wp*

Technology of the grinding and polishing of plate glass

N. Kachalov. *Library of Congress Mthly Index Russ Access* 1958 Vol 11 (9) p 2719 (Dec) (Original in Russian)

Book, Izd-vo Adak nauk SSSR. 1958, 382 pp. [Not in library of Ind Diamond Inf Bur].
X *Bm Chm*

Steuben glass

S. M. Parkhill. *Compr Air Mag* 1958 Vol 63 (11) pp 14-19 (Nov)

The manufacture of Steuben glass, from the original combination of raw materials to the final engraving, is described. A photograph shows a goblet having the name Steuben engraved on its base with a diamond stylus. 15 illustr.
A *Bm Cp Ncb/Bm Qc*

Behaviour of abrasive grain in polishing (of glass)

A. V. Troitskii. *Steklo i Keram* 1958 Vol 15 (8) pp 22-25 ; *Am Ceram Soc Journ & Abstr* 1959 Vol 42 (1) p 6 (Jan) (Original in Russian)

The theoretical conditions determining the nature of the movement of abrasive grains during polishing are discussed. Such movement depends on the moment and the force acting on the grain, its shape, and the roughness of the polishing medium and the glass. These factors are discussed mathematically, and several formulas are derived. It is concluded that small angular grains slide over the glass and cut or abrade it. Polishing with this type of grain is more efficient than with the rolling-grain abrasion.
X *Bm Chm Rd Un*

Mastering the simultaneous two-side polishing of sheet glass

M. P. Nol'ken. *Steklo i Keram* 1958 Vol 15 (9) pp 7-12 (Sep); *Library of Congress Mthly Index Russ Access* 1958 Vol 11 (9) p 2717 (Dec) (Original in Russian)

X *Bm Chm*

MACHINING OF STONE, ETC

Thin wall diamond bits for hard materials

W. H. Hampton. *Grinding & Finishing* 1959 Vol 4 (9) pp 42-43 (Jan)

Thin wall bits for ceramic, glass, marble, and other hard and brittle materials are available in a variety of forms. Diamond-impregnated bits are produced in combinations of 13 bonds and nine mesh sizes of diamond — from 35 to 140 mesh — with a bit face width from 0.015 to 0.125 inch. Surface set diamond bits, with a face width of approximately ½ in., use diamonds ranging from 40 to 150/ct according to the intended use; these diamonds are carefully oriented in a matrix of cobalt and iron or similar materials. Three grades of surface set bit are produced: superior brand, general brand, and utility brand. A third type of bit is the combination narrow kerf in which surface set diamonds gradually break up and expose the impregnated diamonds.

Case histories are recounted showing the superiority of these new bits over conventional types. 3 illustr.

W *Cfb Nh*

Slicing and dicing operations on crystals of silicon and germanium

Anon. *Machinery* (London) 1959 Vol 94 (2409) pp 92-94 (Jan 14)

See *Ind Diamond Abstr* 1958 Vol 15 p A195 (Dec). 4 illustr.

W *Bfr Ceg/Bhc Ceg*

Concrete sawing blade

Champion Mfg Co, 2028 Washington Ave, St Louis 3, Mo. *Roads & Streets* 1958 Vol 101 (10) p 124 (Oct)

A new C-60 tungsten carbide-bonded diamond blade is claimed to cut softer and highly abrasive aggregates without loss of life. 1 illustr.

W *Bny Cej Ns Ure*

Clean production

Semiconductors Ltd. *Engineering* 1958 Vol 186 (4836) pp 645-646 (Nov 14)

A short description of the factory and equipment developed for producing transistors. The complete process, from growing semiconductor crystals to transistor assembly, is covered. A diamond-impregnated wheel is used for sawing boules into thin disks. Following lapping and etching, the disks are scribed with a diamond point and cracked into parallel strips. A second scribing and cracking operation produces rectangular blanks. 4 illustr.

W *Bde Ceg Nv Tn*

Cover scene

Anon. *Roads & Streets* 1958 Vol 101 (11) p 23 (Nov)

Describes the coloured cover photograph which shows two C-362 Clipper saws hooked together for sawing the centreline joint on a road. The first saw unit cuts half the depth, while the second completes the full cut of 1 × ½ inch. The cutting rate was about 4,000 linear feet/day, using small diamond blades with coolant. 1 illustr.

W *Cej Nt Qs Sj*

Swiss P 333,120 (May 7, 1956) **H. Fehlmann**

Device for sawing hard materials. Dispositif pour scier des matières dures

For sawing, in particular rubies, sapphires, and germanium, using a thin grinding wheel as saw blade, a continuous oscillation is also imparted to the blade in a vertical plane to its axis, so that the point of attack constantly varies. A number of wheels may be mounted in a series on the same oscillating shaft. (3 claims, 3 illustr).

J *Cej Pc*

ROCK DRILLING

Application of carbide percussion drilling tools in mines. Einsatz von Hartmetall-Schlagbohrwerkzeugen im Bergbau

K. Jaeger. *Neue Huette* 1958 Vol 3 (8) pp 454-461 (Aug); *Battelle Techn Rev—Abstr* 1958 Vol 7 (12) p 808a (Dec) (No 15942) (Original in German)

Carbides and their use in percussion drilling. Auxiliary drilling equipment. Comparison between carbide and steel drills. Manufacture of percussion drilling tools. Cutting angles of drill bits.

X *Cb Cfbf Pl*

Effect of flushing fluids on the core of a core barrel

A. P. Rudenko. *Izv vys ucheb zav; neft i gaz* 1958 (4) pp 45-49; *Library of Congress Mthly Index Russ Access* 1958 Vol 11 (9) p 2662 (Dec) (Original in Russian)

X *Cfb Plb Qs Sjc*

BP 806,406 **Sandvikens Jernverks AB**

(June 29, 1954—conv date, Sweden)

Cutting inserts for rock drill bits

The insert should have high strength in order to achive maximum distance in relation to hard metal wear, and sufficient toughness to avoid breakage and crumbling. If resistance to wear is increased by changing the composition and/or grain size, the cutting insert becomes more brittle; if the toughness is increased, resistance to wear is reduced. Inserts have been produced with zones of more resistant hard metal at their cutting ends, on the periphery of the bit, and/or along its cutting edge. Production, however, is difficult. The insert as shown in Fig 4 and 5 has a zone of

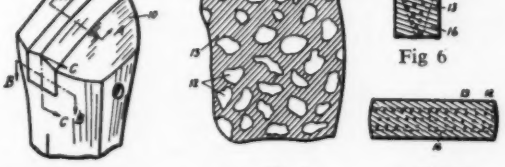


Fig 4 Fig 5 Fig 6 Fig 7

Fig 4 to 7. Details of the rock drill insert, showing the composition of the hard material and cross-sections of the insert. BP 806,406.

relatively hard fine-grained hard metal embedded at random in a matrix of relatively tough coarse-grained hard metal of the same chemical composition. This zone may comprise the whole of the insert, or may be part of the insert as shown in Fig 6 and 7 as cross sections along lines A-A and B-B. The fine-grained granules may have a mean maximum dimension of between 0.05 and 6 mm, while the hard material particles have a mean size below 3 micron. The cutting insert is preferably made as a sintered unit. (20 claims, 13 illustr).

J *Pl Pdcb*

WIRE DRAWING

Some information on diamond dies

W. Lier. *Wire Industry* 1959 Vol 26 (302) pp 147-148 (Feb)

Early literature on the orientation of diamonds is referred to, which leads to the conclusion that the least wear in a diamond drawing die will occur if the hole is drilled perpendicular to an octahedral plane. It was found that by taking the total drawing capacity of a die drilled along the two-fold axes of symmetry as a figure of 100, then comparable wear occurred in dies drilled along the four-fold axes after drawing 108, and in dies drilled along the three-fold axes after drawing 126.5. These results were obtained from diamonds oriented at sight. After orientation by x-ray diffraction, it was found that the total drawing capacity of dies drilled along the three-fold axes amounted to 188, compared to 100 for dies drilled according to the two-fold axes and oriented by the same means.

A table of diameter tolerances is given, and recommendations are made for optimum exit angles. 4 illustr.

W *Fc Ubc:Nkb Unr*

The fundamentals of wire drawing

J. G. Wistreich. *Metallurgical Revs* 1958 Vol 3 (10) pp 97-142; *Battelle Techn Rev—Abstr* 1958 Vol 7 (12) p 822a (Dec) (No 16192)

Mechanics; effects of heat and temperature; wire finish, friction, and die wear; lubrication; wire properties. *X* *Cn*

Dimensional measurements and form control of the section of small diameter metal wire. Misure della dimensione e controllo della forma della sezione di un filo metallico di piccolissimo diametro

U. Casimiro. *Macchine* 1958 Vol 13 (6) pp 545-552 (June) (In Italian)

9 illustr, 4 tables. *M* *An Cn Qd Wp*

GRINDING AND POLISHING OF HARD MATERIALS

Diamond shape governs grinding efficiency

Diamond Res Lab, Johannesburg. *Am Machinist* 1959 Vol 103 (1) p 113 (Jan 12)

Prepared boart is now available from South Africa as a result of a process developed by the Diamond Research Laboratory. The boart, when crushed, produces four shapes: roughly cubic, blocky, flat and irregular, and needle shaped. The first two classifications have a high grinding efficiency. The four types of crushed boart are separated and each type is divided into mesh sizes by conventional screening methods. A sample is drawn and 100 particles are classified. Cubic or near-cubic particles are rated at 1 point, blocky but irregular particles are rated at 2 points, less desirable particles at 3 points, and flats at 4 points. Consequently, the lower the value of a count, the bulkier and more valuable are the particles in the lot.

The blockier 1 and 2 point particles can be separated from the mass, and, if the count of a batch is too high, the 1 and 2 point particles can be added. Another method of reducing the classification of a lot is to subject the whole to hydraulic pressure to break the thinner particles; they can then be sieved out. Prepared boart produces more consistent performance in diamond grinding wheels. 5 illustr.

W *Fd Hvb Kn*

Grinding operations on compressor vanes

Anon. *Machinery* (London) 1959 Vol 94 (2409) pp 77-83 (Jan 14)

Machining operations on stainless steel compressor blades are described. Root forms on the smaller blades are carried out on an Ex-Cell-O two-wheel form grinder using vitrified-bonded aluminium oxide grinding wheels; the wheels are automatically diamond trued when the vane roots are within 0.004 in. of finished size. Tangs are formed on a Norton cylindrical grinder using two 24 in. wheels which are separated from a central 23¼ in. wheel by spacers. A Hoglund hydraulic contour wheel truer, using four diamonds, trues the wheels after they have ground from 10 to 12 vanes. The truing operation is described in detail.

For finishing the root and lug ends of larger compressor vanes, Thompson grinders equipped with Hoglund diamond truers are used; the truing process is explained. 13 illustr.

W *Ab Cg Nj/Aq Bfd Ceg Pr*

Three heads switched on one base to bore, grind, inspect

Cosa Corp. *Tooling & Prodn* 1959 Vol 24 (10) p 40 (Jan)

A new Deckel machine features three interchangeable heads which can be mounted separately or together. It provides for direct reading of table measurements by the projection of precision glass scale graduations through a system of lenses and mirrors. The stationary traverse scale is mounted on the machine base, and the movable longitudinal scale on the worktable slide. Two projection screens are mounted on the cross-slide. Reading accuracy is ±0.00002 in.; positioning accuracy is within 0.00012 inch.

The boring spindle has 20 speeds between 40 and 3,150 rev/min., and 6 up-down feed rates. The spindle of the jig grinding attachment has 12 planetary motion speeds between 40 and 500 rev/minute. Grinding speeds for all grinding applications are infinitely variable between 15,000 and 60,000 rev/minute. The measuring attachment projects images on a 7⅞ in. screen to a mganification of 10 or 20×. 1 illustr.

W *Chc Pr Ps*

Precision grinder roughs and finishes small tools

Agathon AG, Solothurn, Switzerland. *Design News* 1958 Vol 13 (20) p 10 (Sep 29)

A high precision bench-type grinding machine for sintered carbide tools up to ½ in. in width, employs double-sided lapping and grinding wheels for roughing and finishing operations. Accurate micrometer feed and sensitive reciprocating motion of the tool increase the service life and efficiency of the diamond grinding wheels. The machine is of rigid design, and uses friction bearings. Lubrication is fully automatic, and a flat belt drive minimizes noise. 1 illustr.

A *Al Bkc Chc Nv Pr*

Grinding and polishing mass-produced components

Gebr Hau GmbH, Offenbach a Main-Buergel. *Progressus* 1958 Vol 39 (4) p A33 (Aug)

The grinding and polishing unit is for universal applications. A four-spindle turret head will accommodate workpieces up to 8¼ in. diameter, and the components are chucked mechanically or pneumatically, so that much work can be done which would not normally lend itself to gripping or tensioning by mechanical means. Machining times are infinitely variable in a range of 3 to 45 seconds. A stroke movement of 0 to ½ in. is provided for machining cylindrical parts. Two universally adjustable polishing units, type RA, are powered by 5½ or 7½ hp motors. The polishing equipment is particularly suitable for dealing with components requiring two operations. Capacity is from 250 to 1,000 pieces/hour. 1 illustr.

A *Chc Pr/Chm Pr*

Cam-actuated rocking table facilitates ellipsoid grinding

Off Mecc G. Zocca & Co, Como Cameolata, Italy. *Design News* 1958 Vol 13 (17) pp 34-35 (Sep 1)

In this machine the cam follower swings a balance lever pivoted to the rocking worktable. Under the balance lever, a support roller slides to vary the lever arm, which is applied to the worktable, thus changing the oscillation amplitude. This oscillation provides the desired ellipsoid shape on the workpiece. A stationary template is used to ensure that the predetermined ellipsoid shape is obtained. The tailstock is hydraulically operated, and the high spindle speed produces a suction in the bushing depressions which circulates the lubricant. 3 illustr. *A* *Chc Pr Psw*

Damage to tools in grinding. Schleifschaeden an Werkzeugen

H. Traub, Maschinenfabrik, Reichenbach/Fils. *Technica* 1959 Vol 8 (2) p 83 (Jan 16) (In German)

More damage is done by bad grinding of a tool than by inappropriate use of the tool itself. For this reason it is becoming normal practice to use special grinding machines for grinding chip breakers, which ensure that the chip step is of a satisfactory shape and accurate dimensions. Two such machines are described. The first is type SNS 100, in which a specially-formed diamond grinding wheel is cleaned by a paraffin-soaked strip of felt. The second machine is type BLM 400, in which the grinding is done by means of a silicon carbide band. 2 illustr. *A* *Al Chc Pr*

Jones-Shipman precision grinder

Anon. *Machinery Lloyd* 1959 Vol 31 (1A) p 74 (Jan 10)

A special purpose grinding machine for grinding aircraft wing sections has been based on the firm's standard model 1014 universal toolroom grinding machine. The upper part of the wheelhead on this model is entirely new, the spindle unit being direct motor-driven and carrying a cup-type grinding wheel on the front end. The wheel spindle unit is pillar-mounted, so that it can be adjusted both horizontally and vertically. *A* *Chc Pr*

An exclusive grinding and finishing report . . . The state of the industry 1958-1959

Anon. *Grinding & Finishing* 1959 Vol 4 (9) pp 22-29 (Jan)

The big development of 1958 was the introduction of synthetic diamonds in production quantities. New bonds and abrasives are expected to have a considerable effect on the grinding and finishing industry during 1959. *W* *Fh.13.342/Rd.13.342*

Grinding of milling cutters. Schleifen von Fraeswerkzeugen

Anon. *Technik & Betrieb* 1958 Vol 10 (12) yellow insert pages (Dec); 1959 Vol 11 (1) yellow insert pages (Jan) (In German)

(Cont). The clearance angle and surface are discussed. The surface should be large and the angle small, and their exact dimensions depend on the diameter of the tool, as well as on the rate of infeed. The smaller the diameter, the greater must be the clearance angle, so that the cutter does not 'press'. Formulae are provided for calculating correct tool geometry. 3 illustr.
A *Alc Chc*

Grinding and hand finishing metal cutting tools

I. Alfimova. *Sel' Mekh* 1958 (7) pp 37-39; *Library of Congress Mthly Index Russ Access* 1958 Vol 11 (9) p 2719 (Dec) (Original in Russian)
X *Al Chc/Al Chm*

Grinding parallel faces of bearing rings

Anon. *Mass Prodn* 1958 Vol 34 (10) pp 112-113 (Oct)

A plunge-cut method of grinding these parts on a Duplex grinding machine is described. The pieces are passed through the two vertical opposed grinding wheels, but for certain types of large ring with a somewhat heavy stock removal some modifications are advisable in this procedure. A Scrivener machine has been specially produced for this purpose. 3 illustr.
A *Az Ched Pr*

When and how to grind drill bits

Bay State Abrasive Products Co. *Engg & Min Journ* 1959 Vol 160 (1) pp 79-80 (Jan)

Hints are given on grinding various types of rock drill bit. *W* *Alb Chc*

Accuracy, automation prompt design of new double disc grinder

Besly-Welles Corp, South Beloit, Ill. *Grinding & Finishing* 1959 Vol 4 (9) pp 36-38 (Jan)

The DH 4 double disk grinder is designed to give accuracies of 0.0001 inch. A new automatic truing technique is used: a U-shaped spacer is retracted from the feed screw allowing the quills to move apart to a predetermined distance. This allows for the entry of the truer. Compensator units move the wheels into the truer, and after the operation the quills return to the grinding position, compensating for the abrasive removed during truing.
W *Chc Pr/Ab Cg Pf*

New geometry of drill grinding

I. F. Bychkov, V. S. Kosarev. *Izobr i rats* 1958 Vol 3 (5) p 13 (May); *Library of Congress Mthly Index Russ Access* 1958 Vol 11 (9) p 2719 (Dec) (Original in Russian)
X *Alb Chc*

The manufacture of power-steering units for Chrysler cars

Chrysler Corp, Indianapolis. *Machinery* (London) 1959 Vol 94 (2412) pp 251-255 (Feb 4)

A Plugmatic honing machine with diamond-impregnated hones is used for producing the fine tolerance required on valve bodies. 8 illustr.
W *Az Chh Nqe*

Machine tool accessories, precision measuring instruments and gauges

W. Erdmann. *Progressus* 1958 Vol 39 (4) pp PR3-PR9 (Aug)

The tools and instruments shown in the 1958 Milan fair are reviewed, amongst them being the high duty vitrified-bonded diamond grinding wheels available in many sizes for grinding sintered carbide tipped tools, from Ernst Winter & Sohn. Combined form wheels for grinding glass and ceramic materials have also been produced by this company, and diamond-tipped saw blades are manufactured in thicknesses from 12 SWG. 41 illustr. *A* *Ng/Nv Urf*

Grinder reproduces three-dimensional cams

FSA Engineering. *Tool Eng* 1959 Vol 42 (1) pp 61-68 (Jan)

A new grinder for the production of cams uses a three-dimensional tracing mechanism to reproduce cams from a master with an accuracy of ± 0.0005 inch. The simple design of the spindle holder and follower bracket permits the units to be positioned to follow the easiest path during the grinding cycle. A compound truing mechanism trues grinding wheel and tracing stylus in one operation. 2 illustr.
W *Az Chc Pr/Pf*

Disk grinder grinds metallic or non-metallic parts up to 18 in. dia

Gardner Machine Co, Beloit, Wis. *Am Machinist* 1958 Vol 102 (27) p 78 (Dec 29)

The 2H4OL double horizontal spindle disk grinder is available with 36 or 42 in. diameter abrasive disks. It will accommodate metallic or non-metallic parts up to 18 in. diameter, and it carries an automatic diamond truer. 1 illustr. *W* *Chcn Pr*

60 degree angle tool-grinding attachment

Horst's Machine & Experimental Shop, 2801 Steele St, Denver 5, Colo. *Machine & Tool Blue Book* 1958 Vol 53 (10) p 296 (Oct)

The unit is designed for use with any conventional pedestal tool grinder or bench grinder used in large machine shops or small hobby shops. It has only two moving parts and is made of hardened and ground steel. 1 illustr. *W* *Al Chc Pr Ps*

Lamina guide bushings microhoned for functional precision—long life

Lamina Dies & Tools Inc. *Cross-Hatch* 1958 Vol 10 (4) pp 2-3 (Nov-Dec)

Final precision operations on bronze-plated guide bushings are carried out on a Hydrohoner 728 using Microhoning tools. Stock removal is from 0.001 to 0.003 in./30 sec on Ampco bronze, bronze-plated steel, or solid steel bushings. *W* *Az Chhc*

Heavy-duty drill grinder extends drill size range

Oliver Instr Co, 1442 E Maumee St, Adrian, Mich. *Carbide Engg* 1959 Vol 11 (1) p 27 (Jan)

The Oliver 21 drill point grinder has a maximum capacity of 3 in. diameter. Standard equipment includes ¼ hp motor, grinding wheel, diamond truer, jaw assemblies, and setting gauge. 1 illustr.
W *Alb Chc Pr*

Residual stresses produced by up grinding and down grinding

J. A. Mueller. *Grinding & Finishing* 1959 Vol 4 (9) pp 30-33 (Jan)

Following grinding tests, which are described, it is concluded that (*i*) in surface grinding, conventional crossfeeding at both ends of the table reverse produces the same degree of stress in the ground surface as is produced by crossfeeding at only one end; (*ii*) the performance characteristics of the wheel are changed by the method of crossfeeding; and (*iii*) whatever method will produce the most satisfactory end product can be used without changing the residual stress in that product. 5 illustr, 4 ref.
W *Chcm Uqff:Unq*

Sheffield vibration analyser

Sheffield Corp, USA; British Rep: Catmur Machine Tool Corp Ltd, 103 Lancaster Rd, London W 11. *Machinery* (London) 1959 Vol 94 (2413) p 306 (Feb 11)

A new electronic analyser detects lack of balance in grinding wheels, motors, or shafts. Accurate wheel balancing can be carried out quickly, with consequent improvements in work finish and wheel life. 1 illustr.
W *Pr Qd Wp*

TRADE NAMES INDEX 1959

The Industrial Diamond Trade Names Index for 1959 is now in preparation. Inquiries should be sent to: Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1. Publication date is Autumn, 1959.

BP 804,376 **M. Ferrand**

(Apr 18, 1955—conv date, France)

Method and apparatus for making abrasive tools

Abrasive belts for finishing surfaces of precious metal must not remove too much material and not leave fine scratches or the like, the quality of the finish depending on the fineness and hardness of the abrasive layer. Normally such layers are applied to a backing band of a hard flexible material. The new method forms directly a continuous belt of bonding metal containing layers of even thickness of abrasive particles by depositing successive layers of abrasive particles, *eg* diamond powder, on each portion of a moving endless belt carrier, and simultaneously and continuously depositing bonding metal on the carrier by electrodeposition at such a rate that the abrasive particles become completely enclosed before the next deposition of particles. The method may be carried out in a bath containing a solution of, *eg* nickel sulphate, nickel chloride, and boric acid, in which a carrier belt is driven around rollers. Diamond powder is distributed from a hopper through a valve, and current transmitted to deposit the bonding metal. At the end of the operation the carrier belt is removed leaving a thin metal band, in which the abrasive is enclosed, which is uncovered before use by grinding the faces of the band. (4 claims, 2 illustr). *J* *Km Lfdd Nv*

BP 806,282 **E. Bisterfeld, Bisterfeld & Stolting**

(Aug 12, 1954—conv date, Germany)

Flexible abrasive wheels

A number of short, hollow, thin-walled abrasive cylinders are concentrically arranged on a common supporting disk. The cylinders are of such different diameters as to be widely spaced from one another. They are made from laminated layers of fabric saturated with resin and sprinkled with abrasive granules. Each cylinder may be built up from segments. By the arrangement of the widely spaced abrasive cylinders on a common disk, a face grinding wheel is produced with wide and deep dust collecting spaces between the individual cutting faces. (14 claims, 7 illustr). *J* *Chcm Pe*

BP 806,805 **W. Osenberg, E. Bisterfeld, Bisterfeld & Stolting**

(June 12, 1954—conv date, Germany)

Grinding tools

A number of flexible (perforated) grinding bands are bent into rings and clamped between holding devices (steel rings) concentrically arranged on a carrier disk so that an edge of each band slightly projects. Oriented diamond crystals (boart, boron carbide, etc) are embedded in the bands. Electric current may be fed to the rings in order to use electro-erosion in connection with an electrolyte and a grooved plate guiding the material to be ground under the rings. Fig 8 is a vertical section through a tool with three concentric

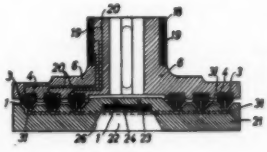


Fig 8. The tool shown here uses three concentric grinding bands embedded with diamond or other abrasive crystals. BP 806,805.

grinding bands 1 between clamping rings 3 and 4 in carrier disk 6 over plate 21. An electrolyte (coolant) may be fed through bores 24 and leads 20 carrying current to the steel rings for *eg* electrolytic grinding. The setting with diamond crystals is effected in a known manner, *eg* by bedding the crystals between weldable foils which are heated in a protective gas atmosphere and subsequently pressed or rolled together. (12 claims, 7 illustr). *J* *Pee*

BP 807,250 **W. Winter, Ernst Winter & Sohn**
(Jan 26, 1956—conv date, Germany)

Grinding or lapping wheels

A grinding ring carrying an abrasive coating is connected to a central hub part by a spring diaphragm, so that the ring can yield against the grinding pressure.

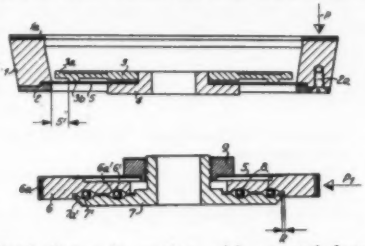


Fig 9 (above) and 10. Two possible applications of the new device. BP 807,250.

Fig 9 is a wheel shown in section with an end face diamond coating ; Fig 10 has a peripheral grinding face. Spring 5 connects members 1 and 4, Fig 9, or 6 and 7, Fig 10. The elasticity may be varied either by the size of disk 3 or by adjusting nut 9. Under grinding pressure P, Fig 10, ring body 6 moves obliquely against the spring action of the diaphragm, and balls 8 facilitate the return to the initial position. (5 claims, 5 illustr).
J *Pee*

BP 807,274 **W. Osenberg, E. Bisterfeld, Bisterfeld & Stolting**
(Dec 31, 1954—conv date, Germany)

Manufacture of hollow cylindrical abrasive members

The grinding rings are wound from widths of fabric having one or more annular zones saturated with a thermosetting resin free of hard granules between annular zones saturated with resin and containing hard granules (metallic or non-metallic particles). The zone

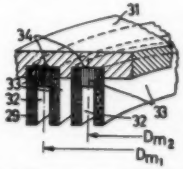


Fig 11. A cross-section of the hollow cylindrical abrasive rings. BP 807,274.

free of hard granules is partially cut away to form grooved rings. The rings are made by annularly winding alternating parts of fabric free from granules with fabric embedded with granules, then inserting the wound rings in a moulding tool on a base plate, filling the interior with a plastic mass by a press ram and setting the synthetic material by heat. A mandrel may also be used. Finished rings Dm_1 and Dm_2 with cut-away grooves 32 are shown in fragmentary cross-section Fig 11. (11 claims, 7 illustr). *J* *Pee*

Swiss P 333,285 **H. Amrhein, E. Landeck, Fritz Wendt KG**
(Sep 24, Nov 20, 1953 ; Mar 8, 1954—conv date, Germany)

Method and device for machining surfaces, in particular fine grinding. Verfahren und Vorrichtung zur Bearbeitung von Oberflaechen, insbesondere zum Feinschleifen

The development of grooves and scratches by abrasive granules moved through the same path along a work-piece several times can be avoided by imparting to the rotary grinding tool an additional oscillating movement. This has been done already for the fine grinding of bodies of revolution. In order to avoid the forming of grooves on workpieces which are not bodies of revolution, two oscillating movements are imparted to the tool, preferably in directions at right angles to each other. The movements should be of different amplitudes and frequencies resulting in a complicated path of the single abrasive grain eliminating grooves and scratches. Fig 12 shows the general arrangement of a machine

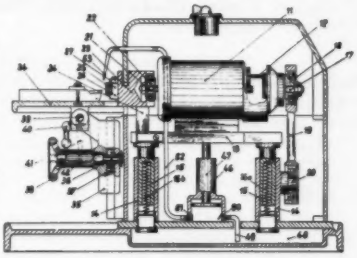


Fig 12. Vertical and horizontal oscillating motion is used here for fine grinding. Swiss P 333,285.

with a flat abrasive stone grinding a cutting tool by vertical and horizontal oscillation derived from vertical movement of electric motor 11 through eccentric 18. (13 claims, 9 illustr). *J* *Chct*

Swiss P 333,625 (June 3, 1955) **W. Osenberg, Bisterfeld & Stolting**

Method of making a plastic bonded abrasive body. Verfahren zur Herstellung kunststoff-gebundener Schleifkoerper

The mould provided with nozzles and vents is filled with abrasive grains which are then concentrated by oscillation and compression. The plastic mass is then injected through the nozzles and cured. This method results in a greater concentration of the abrasive grains with correspondingly greater grinding effect. It is furthermore possible uniformly to fill moulds with complicated profiles, and to produce abrasive bodies of large diameter. A mixture of abrasive grains and other granular material (ceramic, glass) may be injected, and the granular material removed afterwards from the outer zones of the finished product by a solvent. (8 claims, 5 illustr). *J* *Pe Urb:Qc*

NEW MACHINING METHODS

A new tool is developing : the electric spark. Un nouvel outil se développe : ' L'étincelle électrique '

A. Dessart. *L'Usine Belge* 1959 Vol 36 (1613) pp 8-11 (Jan 17) ; (1614) pp 8-14 (Jan 24) ; (1615) pp 6-9 (Jan 31) (In French)

The subject is reviewed in detail, and examples of work produced, such as moulds for metal work and pattern cutters for cutting paper, are described and illustrated. In the final article a list of the types of process carried out by spark erosion, and the materials which lend themselves to this method, is provided. 29 illustr, 17 ref. *A* *Ceqm*

Carbon drill cuts tungsten

F. P. Faltersack, Santa Clara Univ, Santa Clara, Calif. *Am Machinist* 1959 Vol 103 (1) p 138 (Jan 12)

No diamond, ultrasonic, or electric-arc drills were available when it was necessary to produce a $\frac{1}{8}$ in. hole lengthwise through a $\frac{1}{8}$ in. square × 4 in. long piece of tungsten carbide. Several carbon drills were heated at the tip to a cherry-red, and then quenched in mercury. The workpiece was heated to a dark-blue colour during drilling, and several drills produced the necessary hole. *W* *Cfb Pl Qk*

Ultrasonic quartz cutting equipment

Raytheon Mfg Co, Waltham, Mass. *US Govt Res Rep* 1958 Vol 30 (4) pp 237-238 (Oct 17)

A technical manual (PB 132042, photostat $16.80, microfilm $5.70) and supplement (PB 132043, photostat $24.30, microfilm $7.50) are available from Library of Congress, Photoduplication Service, Publications Board Project, Washington 25, DC.

W *Bcb Ceqr Pr.523*

Electro-erosion makes tools for valve parts

P. Trippe (Mullard Radio Valve Co Ltd). *Metalworking Prodn* 1959 Vol 103 (5) pp 179-183 (Jan 30)

5 illustr. *W* *Az Ceqn*

BP 803,887 **Western Electric Co Inc**

(Dec 31, 1954—conv date, USA)

Method and apparatus for the electrolytic shaping of electrically conductive bodies

Many semiconductive signal translating devices require wafers with parallel surfaces approaching optical flatness and spaced apart less than ten mil. Hitherto such wafers have been sawn from a massive body, then ground and polished to remove thermally and mechanically strained material, and finally chemically etched to obtain a strain-free surface and the correct thickness. This procedure is expensive and wasteful as the yield of useful material is less than 5%. In the new method, sawing and polishing is eliminated by passing an etching current between a thin wire and the body to be cut through a stream of electrolyte maintained between the cathodic body by adhesion and surface tension. During the cutting operation, the body is moved in the direction of producing the cut. Control of current, of body feed, and of the flow of electrolyte are variable according to the material to be cut and the desired shape of the cut. It has been found that kerf widths of less than 5 mil can be obtained. In the production of 5 mil wafers, 50% material utilization is possible. (15 claims, 5 illustr).

J *Bde Ceqh Tn*

BP 806,427 **Technical Ceramics Ltd**

(Feb 28, 1956—conv date, USA)

Drilling of hard brittle materials

Ultrasonic drilling has been used for making holes and intaglios in hard, brittle materials by driving abrasive particles, in suspension, against the work at high velocity through ultrasonic axial vibration of the tool; this results in erosion of the workpiece directly under the tool. For drilling glass, ceramics, sapphire, diamond, tungsten carbide, etc, a combination of the often unsatisfactory mechanical rotational drilling with axial ultrasonic cutting results in symmetrical holes with uniform wear of the tool end while achieving a high cutting rate. Fig 13 is a part sectional side elevation of a drill whose spindle 13 is coupled to motor 12 at one end, and is threaded into a horn 15 at its other end. A conductive band 14 is placed around transducer 11 at the nodal surface. Ultrasonic excitation is applied to transducer 11 through brush contacts 16, 17. Tool end 20 acts against the workpiece on table 21 while being rotated by motor 20 and axially vibrated by transducer 11. The abrasive slurry acts as a grinding compound through rotation and as an eroding compound while thrown at high velocity against the workpiece under the tool end. (9 claims, 1 illustr).

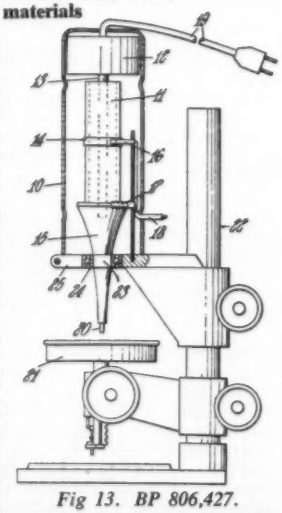


Fig 13. BP 806,427.

J *Cfbk Pl*

BP 807,897 (Sep 12, 1955) **E. M. Williams, Firth Sterling Inc**

Apparatus and method for machining a workpiece by spark erosion

The object is a relatively simple spark machining apparatus working at greater speed and more effectively utilising available electrical energy. Fig 14 shows the mechanical arrangement in a frame similar to a drill press. Workpiece 5, *eg* of tungsten carbide, is held in a bath 8 of paraffin oil or other liquid dielectric. Tank 29 serves as part of a low inductance discharge circuit for capacitor 3 and is made of copper or steel. Legs 35 are insulators so that the workpiece is insulatingly spaced from the tank walls. 39 is a flexible connecting strap between terminal 37 and workpiece base 34 of copper. A number of capacitor units may be positioned in the tank to provide the desired capacitance or voltage rating. 40 is one of several flexible conductors between the tank and the electrode holder on collar 41. The flexible straps close the tank top to define a very low surge impedance coaxial transmission line connection between capacitor, workpiece, and electrode tool through the tank itself. The result is an increase in the peak current, while the initial current impulse is reduced and the oscillation of the spark current damped more rapidly to permit more rapid recharging and faster repetition rates. (13 claims, 10 illustr).

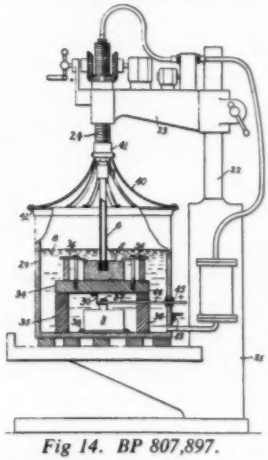


Fig 14. BP 807,897.

J *Ceqm Pt*

Swiss P 333,268 (Oct 5, 1955) **M. Wiedemann, AG fuer Maschinenbau**

Device on machine tools for machining workpieces in a liquid bath, in particular for removing conductive material by spark erosion. Einrichtung an Werkzeugmaschinen zum Bearbeiten von Werkstuecken in einem Fluessigkeitsbad, insbesondere zur Abtragung elektrisch leitender Werkstoffe durch Funkenerosion

For inspecting the workpiece it has been necessary up to now to drain the tank containing the bath, at least partly, and then to fill it again. A suggestion to make the tank of transparent material is not helpful because in practice the walls and bath become dirty, making inspection impossible. These drawbacks are overcome by mounting the workpiece on a table which is arranged on top of a column passing through the bottom of the tank. For inspection, the tank is lowered along the column until the table with the workpiece projects sufficiently from the surface of the bath to enable inspection. (5 claims, 3 illustr).

J *Ceqm Pt*

DIAMOND RECOVERY

Indusmond-Torit dust collector

Indusmond (Diamond Tools) Ltd, 4 Greville St, London EC1. *Metalworking Prodn* 1959 Vol 103 (3) p 129 (Jan 16)

The Indusmond-Torit dust collector is for use with diamond grinding wheels. Up to 10% of grinding wheel costs can be recovered. 1 illustr.

W *Hvm Pw*

SURFACE FINISH TESTING

Surface roughness tester

Brit Phys Labs, Radlett, Herts. *Engineering* 1959 Vol 187 (4845) p 69 (Jan 16)

Surface roughness measurements between 10 micro-in. and 0.01 in. can be measured by a new instrument. A probe produces an output potential proportional to the displacement caused by surface irregularities. The potential is generated by the Hall effect. Average or peak readings can be made.

W *Cx Wgf*

Measurement of casting surface roughness

C. H. Good, C. E. McQuiston. *Foundry Trade Journ* 1958 Vol 105 pp 191-195 (Aug 14); *Battelle Techn Rev—Abstr* 1958 Vol 7 (12) p 816a (Dec) (No 16105)

The various terms used in the study of surface roughness are defined, and a survey is given of the methods available for evaluation and control of this factor. *X* *Am Cx*

An instrument for tracing surface profile using an interferometer microscope

A. I. Kartashev. *Izmeritel Tekh* 1958 (5) pp 11-13 (Sep-Oct); *BSIRA Bull* 1958 Vol 13 (12) p 358 (Dec) (Original in Russian)

The instrument is a combination of an interferometer microscope and probe which follows the surface profile. It is used for non-reflecting surfaces which cannot be inspected directly by an interferometer microscope.

X *Cx Wcmf*

Effect of some technological factors on the surface smoothness and the durability of antifriction bearing balls

P. I. Yashcheritsyn, L. N. Kosachevskii. *Mash Bel* 1957 (4) pp 132-137; *Library of Congress Mthly Index Russ Access* 1958 Vol 11 (9) p 2652 (Dec) (Original in Russian)

X *Az Ceq Unf*

Swiss P 333,560 (June 12, 1955) **R. Kocherhans, H. Hediger**

Apparatus for measuring surface roughness. Geraet zur Messung der Oberflaechenrauhigkeit

The feeler point, a diamond, is reciprocated over an adjustable length of the test surface with constant speed. The diamond point has an accurately defined radius and included angle. The indicating instrument may include a compensator so as to show zero as long as a certain value is not exceeded, and may be combined with an electronic relay controlling a signal device. A frequency filter may be used to separate high frequencies caused by roughness and low frequencies caused by waviness of the surface. (3 claims, 3 illustr).

J *Cx Nd Wgf*

MISCELLANEOUS

1959 production preview

Anon. *Am Machinist* 1959 Vol 103 (2) pp 101-228 (Jan 26)

The 1959 Production Review issue reviews machine tools for all workshop applications.

W *Pr.515*

Cut costs on machining die castings

Anon. *Precision Metal Molding* (USA) 1958 Vol 16 (8) pp 23-28 (Aug); *ZDA Abstr* 1959 Vol 17 (1) p 2 (Jan)

A special machine tool, sometimes capable of performing four or five types of operation, will often give faster, cheaper, and better results than standard tools with their high jig and tooling and direct labour costs. Standard units which can be re-assembled may also be combined to give the number and types of machining operations required. 20 such machines are illustrated and described.

X *Am Ceq Pr*

Russian machine tools in Brussels. Russische Werkzeugmaschinen in Bruessel

A. Schatz. *Werkstattstechnik & Maschinenbau* 1958 Vol 48 (12) pp 627-631 (Dec) (In German)

12 illustr. *A* *Pr.33:.27*

Industrial diamonds in the United States

Anon. *Ind Diamond Rev* 1958 Vol 18 (216) p 218 (Nov)

An illustrated break-down of the uses to which industrial diamonds are put in the United States. 1 illustr. *W* *Fc N.342*

Improving machine performance through better use of tools and reduced non-productive times

A. Schatz. *Progressus* 1958 Vol 39 (4) pp 57-74 (Aug)

A detailed examination of machine performance and individual machines on the market is divided into sections on machines with reciprocating main motion, milling and sawing machines, drilling and boring machines, turning machines, grinding machines, gear-cutting and thread generating machines, and tool grinding machines. The tools specifically mentioned as used are of sintered carbide. 84 illustr.

A *Pr Uqe*

Production of Hoybide cemented [sintered] carbides

Hoy Carbide Ltd, High Wycombe, Bucks. *Machinery* (London) 1959 Vol 94 (2413) pp 307-310 (Feb 11)

5 illustr. *W* *Bk Cql*

BP 807,769 **Firth Sterling Inc**

(Feb 3, 1955—conv date, USA)

Carbide composition and procedure for making

A general purpose type of carbide composition or alloy product combining good transverse rupture strength, hardness, and cutting index is obtained by a compacted and sintered tungsten carbide and titanium carbide in solid solution with cobalt dispersed therein, in which the titanium carbide is at least fully saturated by the tungsten carbide in the solid solution with a predominance (vol) of the solution over the auxiliary ingredients, the tungsten carbide being in predominance over the other ingredients. The proportions of the total metal content are 54.3 to 63.7% (vol) of tungsten carbide, 25.5 to 36.0% of titanium carbide, and 6.3 to 12.0% cobalt. The composition proved superior as a cutting tool showing 20 to 25% less wear at 5 cuts and 23% less wear at 20 cuts in comparison tests on a 10 in. milling machine. (13 claims, 4 illustr). (Micrograph and diagram). *J* *Bkc Utb*

PUBLICATIONS RECEIVED

BOOK REVIEWS

Coated abrasives—modern tool of industry

Coated Abrasives Manufacturers' Institute. McGraw-Hill Book Co Inc, New York, Toronto, London. 1958, 426 pp, illustr, index. Price : £3 6s 0d

Coated abrasives — principally belts — are used for grinding a range of products from coffins to eggs, and, more commonly, from metallographic specimens to glass. The types of abrasive in common use are flint, emery, garnet, crocus, aluminium oxide, and silicon carbide. No mention is made of diamond-coated abrasives. All other aspects of coated abrasives polishing are dealt with in the book, including the manufacture of the commercially available product. Advice on equipment and machinery for use with the abrasive belt, or disk, is described, and many applications are illustrated and explained. Operations on metals, glass, plastics, and other hard and tough materials are dealt with. The book is well printed, attractively illustrated, and has a clear and comprehensive index. It would be invaluable in any modern workshop.

W *Chc Pee*

Tool and cutter grinding

R. S. Connell. The Machinery Publishing Co Ltd, National House, West Street, Brighton 1. 159 pp, illustr, tables. Price : 18s 6d

Generously supplemented by illustrations, the text deals with the practical aspects of servicing tools which require fairly frequent sharpening or grinding, *eg* turning tools, twist drills, broaching and gear cutting tools, and sintered carbide tools. The introductory chapter describes the equipment needed for tool grinding, including grinding wheels and diamond truing devices. The section on sintered carbide tools describes several types of diamond wheel suitable for carbide grinding applications.

W *Al Chc/Bkc Chc Nv*

Gem testing

B. W. Anderson. Heywood & Co Ltd, London. 1958, 334 pp, illustr, tables. Price : £2 2s 0d

The sixth edition of this useful reference book has been revised throughout in order to bring the text entirely up to date, and it includes a new chapter on fluorescence.

The chapter on the identification of diamond has been altered only slightly, and retains all the features of earlier editions, including the table of possible substitutes for diamond, *eg* zircon and strontium titanate, in which some of their properties are listed. Although synthetic diamonds have been produced since the last edition of this book was published, comment is confined to a note to this effect.

W *Vwdb.52*

Canadian Machinery 1959 Directory and Catalogue

Maclean-Hunter Publishing Co Ltd, 481 University Ave, Toronto 2. *Canad Machinery* 1958 Vol 69 (12) (Dec) 784 pp illustr indices. Price : by subscription

Notable principally for the number of advertisements carried, the Directory also provides a detailed coverage of machinery and allied equipment manufacturers. Entries show names and addresses of the companies, which include those concerned with the manufacture and distribution of diamond tools. There are several original articles on workshop topics together with data sheets and 'news of the trade' items.

W *.241.343.56*

Yearbook of surface technique. Jahrbuch der Oberflaechentechnik 1959

Metall-Verlag GmbH, Berlin-Grunewald, Hubertusallee 18. 1959, 15th ed, 1098 pp, illustr, tables. Price : DM 22.50 (In German)

The 15th edition, like the previous ones, contains some 36 original articles, many of them concerned with electrolytic grinding and polishing of various kinds. Exhaustive surveys of technical literature, new patents, and standards are provided.

A *Chcr/Chm.515/Chmk*

TRADE LITERATURE

Diamond dressing tools

American Standard ASA B67.1-1958. American Society of Tool Engineers, Industrial Diamond Association of America. 8 pp, 8½ × 11 in., illustr

See *Ind Diamond Abstr*, this issue, p

W *Nj.255*

Jones-Shipman precision machine tools, No 16 issue

A. A. Jones & Shipman Ltd, Narborough Rd South, Leicester. 8 pp, 6¼ × 9 in., illustr

A general catalogue which shows examples of work carried out on rock drill and chipping hammer components with the Hydrohoner 715. Six operations on tungsten carbide tools, using Jones-Shipman precision grinders, are illustrated. Also shown are the Jones-Shipman 1030 production grinder, the Familleureux slideway shaving and grinding machine, and the Hydrohoner 150 which is now being produced in Gt Britain. Jones & Shipman are the British agents for the Unificatore range of lathe tool equipment, examples of which are shown.

W *Al Chc Pr/Al Chh Pr*

Collected catalogues [engraving machines]

Vitos Ltd, 13 Charlotte St, London W 1

A large range of Gravograph engraving equipment and accessories is shown. Engraving can be performed on any material and on flatware, jewellery, watches, tumblers, et cetera. The pantograph reproduction device allows 15 sizes of letter to be drawn from one scale. Cutters are ¼ in. diameter, and can be of HSS, tungsten carbide, or diamond. The faceted diamond-point is used without the motor, unless working on glass when the motor is optional.

W *Cp Nc Pr*

Combination type hard-metal grinding (sharpening) and lapping machine

Maschinenfabrik R. Loescher, Romanshorn, Switzerland ; British Rep : Thoka Machinery Supplies Ltd, 2 Drapers Gardens, London EC 2. 8 pp, 8¼ × 11¼, illustr

The HSL 150 tool grinder is equipped with two 5 29/32 in. (150 mm) grinding wheels : one for rough grinding and one for finishing. The wheels are mounted side-by-side so that both operations can be carried out without undue interruption. The adjustable worktable gives maximum flexibility and accuracy. A coolant supply system allows for wet grinding which saves diamond wheel wear. The chipbreaker groove grinding attachment permits grooves to be ground on tools of any shape, and is controlled by two handwheels with graduated scales. Other attachments available are a twist drill grinder and a radius grinder.

W *Al Chc Pe Pr/Cm Ps*

PATENT LISTS

BRITISH

The Official Journal (Patents) 1959 (3646) (Jan 1)

809,516 NUFFIELD TOOLS & GAUGES LTD. Automatic grinding machines.

The Official Journal (Patents) 1959 (3647) (Jan 7)

809,972 CIMATOOL CORP. Drive mechanism for dressing units for forming multiple-ribbed grinding wheels.

809,810 LANDIS TOOL CO. Crankshaft-grinding machine.

The Official Journal (Patents) 1959 (3648) (Jan 14)

810,127 CRANE PACKING CO. Lapping apparatus.

810,179 LINDNER GmbH, H. Thread-cutting machines, and more particularly thread grinding machines.

810,188 WAGNER & ENGLERT GmbH. Grinding wheels and processes for the production of grinding wheels.

UNITED STATES

Official Gazette 1958 Vol 737 (1-5) (Dec)

2,862,338 O. E. HILL, NORTON CO. Grinding machine.

2,862,409 W. P. McKAIN, FADA RADIO & ELECTRIC CO INC. Tool dressing means.

2,862,415 H. A. KULJIAN. Particle counting optical apparatus.

2,862,492 S. P. BRUCE, A. T. KOHLSTRUNK, WHEEL TRUEING CO. Hydraulic infeeding mechanism for diamond tools.

2,862,493 T. J. PESEE, SCULLI MACHINE CO INC. Device for contouring grinding wheels.

2,862,691 C. D. COCHRAN, JERSEY PRODUCTION RESEARCH CO. Coring bit assembly.

2,862,795 E. C. LOWE, NORTON CO. Process of synthesizing silicon carbide.

2,862,806 L. R. NESTOR, MINNESOTA MINING & MANUFACTURING CO. Moulded rotative abrasive articles and method of making.

2,863,261 W. H. MEAD. Wheel-type abrasive-impelling device.

2,863,265 F. G. AULT, GEORGE SALTER & CO LTD. Means for applying coolant during grinding operations.

2,863,341 N. P. ROSATO, S. E. SIEMEN, UNITED STATES OF AMERICA. Trepanning apparatus.

2,863,440 J. R. HARCLERODE, CLIPPER MFG CO. Masonry saw.

2,863,750 S. M. BOOTH. Method, composition, and apparatus for mechanically setting or resetting diamond particles in a working surface.

Re 24,576 2,796,706 C. W. ANDERSON, NORTON CO. Diamond cut-off wheel.

2,865,198 L. TSCHIRF, F. GAERTNER. Hardness testing apparatus.

2,865,606 D. L. FARMER, CINCINNATI TOOL CO. Rock drill.

2,865,607 C. V. TILDEN. Drill bit.

2,865,607 W. P. McKAIN, FADA RADIO & ELECTRIC CO INC. Tool holder for tool dressing machines.

2,866,301 M. KOULICOVITCH, R. JUVET, SOC GENEVOISE D'INSTRUMENTS DE PHYSIQUE. Warning device comprising a microphone preferably for a grinding machine.

2,866,364 P. BIEBERICH. Wire drawing die blank and method of making same.

2,866,448 J. T. DESSUREAU, J. B. DESSUREAU. Abrasive wire shape-cutting stone saw machine.

2,866,547 W. I. GLADFELTER, M. E. FAHRNEY, PANGBORN CORP. Abrasive separator.

2,866,698 P. L. KUZMICK. Diamond abrasive element.

SOUTH AFRICAN

Official Journal Vol 11 (47-50) (Nov-Dec)

3303/58 L. G. OXFORD, C. H. BOOTH, SIMMONDS AEROCESSORIES LTD. Cutting or abrading tools.

AUSTRALIAN

Official Journal 1958 Vol 28 (44-45) (Nov)

218,244 E. RIGHI. Surface finishing.

SWISS

Patentliste 1958 (21-22) (Nov)

333,835 J. P. ROSENBERG, K. F. ROSENBERG, E. S. ROSENBERG, MOUNTROSE-SCHLEIF - MITTEL - ESTABLISHMENT. Method for producing an abrasive.

333,909 R. EFFGEN, JULIUS EFFGEN & SOEHNE. Method of fusing synthetic boules from synthetic corundum.

334,021 J. DUNOD, QUALITEX SàRL DUNOD & CIE. Machine for spark erosion.

334,041 J. SMEDLEY, ROLLS-ROYCE LTD. Method and device for finishing curved surfaces.

334,044 B. GUINARD, ETAUCHES SA. Method and machine for grinding the round edges of plates, in particular glass plates.

334,046 L. G. SIMJIAN, REFLECTOR CORP. Apparatus for polishing surfaces and for grinding cutting tools.

334,347 J. H. DWYER, PRECISION GRINDING LTD. Pantograph.

334,396 V. E. MATULAITIS, ELOX CORP OF MICHIGAN. Device for electric spark machining.

334,399 J. J. DESHERAULT, ALUMINIUM FRANCAIS. Machining method.

334,407 G. F. KEELERIC, BOART PRODUCTS, SOUTH AFRICA, LTD. Method of making grinding tools.

LITERATURE REQUESTS
When applying for the loan of literature abstracted in this journal, please quote the title of the article, the name of the author, and the number of the page on which it appeared.

FRENCH

Bulletin Officiel 1958 Vol 75 (3892-94) (Dec)

1,174,087 W. OSENBERG, BISTERFELD & STOLTING. Apparatus for grinding plane and curved surfaces by means of tubular grinding rolls mounted in a device so as to permit adjustment after the cutting stroke where the length is a multiple of their exterior diameter.

1,174,641 SOC àRL DIABOR AUDIBERT. Method for fixing cutting tips on cutting tools, and cutting tools, in particular drilling crowns, obtained by this method.

1,174,769 ERNST WINTER & SOHN. Diamond saw.

1,175,270 VEB ZEISS IKON DRESDEN. Device for limiting the depth of penetration of tools.

1,175,280 L. GALLAUD, SA CIE GENERALE D'ELECTRO-CERAMIQUE. Tool holder.

1,176,034 SOC CARBONE-LORRAINE. Method for the industrial production of grinding wheels by incorporation of abrasive elements in a support of soft wood, and wheels obtained by this method.

GERMAN

Patentblatt 1958 Vol 78 (52-53) (Dec); 1959 Vol 79 (1-2) (Jan)

Applications Open to Public Inspection

1,047,141 F. R. JOB jun, UNION CARBIDE CORP. Rock drill blow pipe or burner.

1,047,180 E. ENK, J. NICKL, WACKER-CHEMIE GmbH. Method of making very pure crystalline silicon carbide.

1,147,665 H. MAEDRICH, DISKUS WERKE FRANKFURT a MAIN AG. Control by measuring feeler for surface grinding machines.

1,047,962 M. BRUMA, M. MAGAT, CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE. Method and device for spark erosion.

1,048,182 FRITZ WENDT K-G. Device for working surfaces.

1,048,530 W. BAUER, E. SINGER, SIEMENS-SCHUCKERTWERKE AG. Method for making bodies of hard sintered materials.

1,048,544 W. PRETTIN, WESTDEUTSCHE TIEFBOHRGESELLSCHAFT mbH. Polygonal drill rod for percussion rock drills or the like with a sleeve of organic material and coolant passage.

1,048,705 J. KLEINECKE, GOTTLOB WIDMANN & SOEHNE GmbH. Sound pick-up with exchangeable needle carrier.

1,048,792 S. A. L. BERGMANN, KEMISKA AB CANDOR. Rotary drum for the wet treatment of mass produced articles.

1,048,818 E. LUTZ-DETTINGER. Abrasive body with a mineral bond for the wet grinding of iron and steel.

Patents Granted

971,346 H. BALSCH, TELEFUNKEN GmbH. Sound pick-up or groove cutting head for the simultaneous reproduction and recording of bottom and side script.

971,461 H. HENKER, T. RUMMEL, SIEMENS & HALSKE AG. Method and device for growing crystals.

ABSTRACT NOTIONS

Trade literature for you . . .

Trade literature reviewed in *Industrial Diamond Abstracts* is *not* available on loan. Readers wishing to obtain copies should contact the manufacturer whose address is shown at the beginning of the review.

and for us . . .

In order that readers may be kept informed of developments in the industrial diamond and allied industries, manufacturers are requested to send review copies of their trade literature to: Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1.

Loan Service requests

The Loan Service operated by the Information Bureau is very widely used by firms and individuals in the United Kingdom, so much so that it is not unusual for several requests to be received for the same article. If users of the Loan Service will ensure that borrowed periodicals are returned within the specified 15 days, it will reduce the delay for those on the waiting list.

Patents

At the end of each section in Industrial Diamond Abstracts appear abstracts of those Patents which may be of interest to readers. These patents are available on free loan, or, at cost, in photostat form. Where required, a copy of the original Patent can be obtained for readers.

Trade Names Index

March 31st was the closing date of entries for the 1959 edition of the Industrial Diamond Trade Names Index, and forms received after that date will have little chance of being considered for publication. Publication is scheduled for Autumn.

Addresses

Readers are reminded that it is in their interest to keep the Information Bureau informed of any changes of address.

GENERAL NOTES

The Industrial Diamond Information Bureau is included in the Diamond Research Organization of Industrial Distributors (Sales) Ltd (incorporated in the Union of South Africa), together with the Diamond Research Laboratory in Johannesburg.

Abstracts

The Bureau prepares abstracts of current scientific and technical literature, including patents, on industrial diamonds and associated subjects. These are published monthly in *Industrial Diamond Abstracts*, which is supplied free to those concerned with the use of diamonds for industrial purposes, and to specialist libraries. The publishers do not claim any copyright in respect of abstracts in this journal. No specific acknowledgement is made to other abstract journals, and no objection will be made to other abstract journals using the contents.

The list of journals (latest issue, September 1955) from which *Industrial Diamond Abstracts* is compiled will be supplied on request.

Library

The Bureau has a Reference Library which seeks to cover world literature on the application and production of diamond tools. It is kept up to date by a careful examination of new publications announced in abstract and technical journals, and covers, in addition to English, German, French and Russian books. The library specializes in technical and scientific pamphlets.

Patent Abstracts

Patent lists are prepared from official patent journals of the major industrial countries, and patent abstracts in general from the printed patent specifications. Printed copies of British patent specifications accepted may be obtained from the Patent Office, Southampton Buildings, London WC 2, at 3s each. Numbers given under British applications for patents are for reference in all correspondence up to acceptance of the complete specification.

The following abbreviations are used :—BP for British Patent, USP for United States Patent, DAS for German Patent Application, DBP for German Patent (GP for German Patents issued prior to 1950), FP for French Patent, Canad P for Canadian Patent, and RP for Russian Patent.

Supply of Literature †

1. **Loan Service :** much of the literature abstracted in this journal is available in its original form, and can be borrowed for a period of fourteen days (in Great Britain only).

2. **Reprints :** copies of certain selected articles on industrial applications of diamond are available and can be supplied on request at a charge of 1s each, post free. New reprints are announced from time to time in this journal, and a classified list of reprints, dated September 1958, is available free on request.

Technical Information

The Bureau offers the resources of its considerable literature holdings to those seeking specific information on diamond tool and similar applications. Problems requiring fuller technical assistance can be referred to the Diamond Research Laboratory, Johannesburg.

Inquiries in connexion with these services should be made to Industrial Diamond Information Bureau, Industrial Distributors (Sales) Ltd, 2 Charterhouse Street, London EC 1.

INDUSTRIAL DIAMOND INFORMATION BUREAU

Industrial Distributors (Sales) Ltd, 2 Charterhouse Street, London, EC 1.

LIST OF PUBLICATIONS, MARCH, 1959

***INDUSTRIAL DIAMOND ABSTRACTS:** issued monthly, from 1944 onwards, about 20 pp, 7⅞ x 9¾ in. Surveys technical, scientific, and patent literature.

***LIST OF PERIODICALS—BIBLIOGRAPHY OF INDUSTRIAL DIAMOND APPLICATIONS:** Alphabetical, 8 pp, 7⅞ x 9¾ in., Sep 1955.

***LIST OF PERIODICALS IN THE INDUSTRIAL DIAMOND INFORMATION BUREAU LIBRARY AT MAY 31, 1958:** Alphabetical, 8 pp, 7⅞ x 9¼ in. A list of periodicals available for loan from the Industrial Diamond Information Bureau Library. This does not replace *List of Periodicals* (above), which is a list of periodicals abstracted in *Industrial Diamond Abstracts*, many of which are not held by the Library.

***IDR REPRINT SERVICE :** Classified, authors' index, subject index of groups, 12 pp, 7⅞ x 9¾ in., Sep 1958. (Reprints 1s each, post free).

***THE DIAMOND RESEARCH LABORATORY:** 16 pp, illustr, 11 x 9 in. Rev ed, 1956.

SELECTED BIBLIOGRAPHIES:

* **Truing of grinding wheels** (from 1910 to 1951). 39 pp, 7⅞ x 9¾ in. 3rd rev ed, Feb 1952.

* **Diamond as cutting tool for metals and non-metallic materials.** 24 pp, 7⅞ x 9¾ in. 2nd rev ed, Nov 1950. Name index, 1951.

Hardness and hardness testing (from 1937 to 1955). 118 pp, name index, subject index, 7⅞ x 9¾ in. 1955-56. Price 5s 6d.

DIAMOND TOOL PATENTS (Patent Monographs)

IA: Machining metals and non-metallic substances, by P. Grodzinski, W. Jacobsohn. 2nd rev ed, 55 pp, 7⅞ x 9¾ in. Apr 1949. Price 10s.

II, IIs: Diamond abrasive wheels, by P. Grodzinski. 74 pp, 4 tables, name index, 7⅞ x 9¾ in. Aug 1948/49. Price 13s 6d.

III, IIIs: Truing of grinding wheels, by W. Jacobsohn. 133 pp, 82 illustr, name index, 7⅞ x 9¾ in. Dec 1948/49. Price £1.

IV: Polishing of gem diamonds, by W. Jacobsohn. 40 pp, 83 illustr, 1 table, name index, 7⅞ x 9¾ in. December, 1950. Price 12s 6d.

IA to IIIs available as compilation in Spirollo binding, price £2 9s.

THE PRINCIPLES AND DESIGN OF A NUCLEAR RADIATION COUNTER WHICH USES A DIAMOND AS ITS DETECTOR, by W. F. Cotty. 18 pp, illustr, 7⅞ x 9¾ in. Oct 1956. Price 2s 6d.

DATA SHEETS FOR THE DIAMOND TOOL DESIGNER AND MAKER—Definition and designation of angles: Comparison of names for tool angles: Plane of chip flow: Clearance and rake angles: Minimum clearance for diamond boring tools: Economic layout of tool tips: Height position of turning tools: Accepted standards. 1945, reprinted Oct 1956. Price 5s.

---

* *Publication free of charge.*

HABIT

PERFECT RADIUS DRESSING FOR ONLY £10

The TENNER

MALE & FEMALE

RADIUS DRESSING FIXTURE

Agents required in all countries

A simple, sturdy, reliable radius dressing fixture, fully protected against dust, and accurate to close commercial limits.

CAPACITY 0—3in. Female, 0—¾in. Male } radii

SETTING By gauge blocks, height gauge or micrometer.

OPERATION By direct motion from hand-wheel check stops at 90° and 180°.

FITTING Can be held by magnetic chuck, vice or clamping to bed directly.

PRICE £10 Ex. Works, London. Postage, container and packing inland : 5/-. Suitable Diamond Tool : 35/-.

"A GREAT LITTLE FIXTURE"

HABIT DIAMOND TOOLING LIMITED

294-296 LILLIE ROAD, FULHAM, LONDON, S.W.6 · TELEPHONE FULHAM 7944

Telegrams "HABIT", LONDON, S.W.6

a journal for precision engineers and all users of industrial diamonds and other hard materials

INDUSTRIAL DIAMOND REVIEW

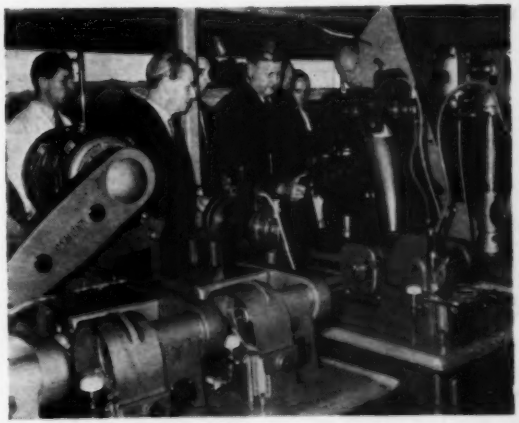
incorporating INDUSTRIAL DIAMOND ABSTRACTS

MONTHLY 1/3 SUBSCRIPTION 15/- A YEAR

March, 1959 Vol. 19 No. 220

a DEMONSTRATION?

IF YOU CUT, drill or grind glass, ceramics, carbide or any known hard material the Neven Mobile Unit will demonstrate most efficient production methods with diamond tools. May we send this Demonstration Unit to your works? The Sales Manager would be pleased to advise you when the Unit will be in your area.



IMPREGNATED DIAMOND PRODUCTS LTD OF GLOUCESTER

JW3

TELEPHONE 21164 (3 LINES) · TELEGRAMS IMPREG GLOUCESTER

IDP